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COMMERCE OF THE GREAT LAKES.*

BY CAPT. C. E. SAYRE.

The great lakes afford an interesting theme which directly concerns many people—more especially, those who sail upon their restless waters; those who dwell in their thriving cities and those interested in their tributary resources. Yet, few are the people of America to whom there has not come many benefits, directly or indirectly, from the masterful influences radiating from a commerce that excites the wonder of nations by the marvelous rapidity of its development, the future of which no one would attempt to measure by existing standards.

There are employed in the operation of the active fleet engaged in lake cammerce about 100,000 sailors, and it is estimated that their season pay roll for 1907 aggregates $62,532,000, and the wages paid to the army of longshoremen, freight hoisters and stevedores employed in loading and unloading the cargoes carried was approximately $255,340,000, making a total of $337,872,000 paid to wage earners who live in the growing and properous cities that cluster round these great inland seas.

There are 12 cities in the United States that have a population of 300,000 or more, and five of them have sprung up along the shores of these Great Lakes within the past century.

About 90 years ago the United States government under the administration of James Monroe, erected and garrisoned Fort Dearborn, then the frontier post of the northwest. Fifteen years later, on the site of this fort Chicago received her first charter as a city and port of entry. Five years of unremitting struggle followed and she was the proud possessor of a safe harbor open to the commerce of the great lakes, and in the fall of 1838 shipped to Buffalo her first consignment of grain, which consisted of 39 bags of wheat. In October, 1839, the brig Osceola loaded the first bulk cargo of grain shipped from Chicago. This memorable cargo, the maiden effort in grain shipment from the northwest, was 1,678 bushels of wheat. We are told that five days were consumed in getting the cargo on board, fourteen days in making the run to Buffalo and seven days in discharging the cargo. The following season, 1840, Chicago shipped six cargoes of wheat aggregating 10,000 bushels. During this season the harbor piers were completed, extensive docks and frieght houses were constructed, the first grain elevator was built and equipped with a steam elevating plant, and the first U. S. census of the city was taken which showed a population of 4,479. This may be considered the initial year of modern commerce upon the great lakes, for it marks the beginning of agricultural growth in the northwest. Twenty years since a glance at the official census and general statistics of 1860 reveals a growth in commerce and agriculture, the magnitude of which has not a parallel in the history of nations. During the nine months of this sailing season Chicago shipped 30,000,000 bu. of grain—2,232,000 bu. more than was shipped the same year from Odessa, Riga, St. Petersburg and Archangle, the four leading grain shipping ports of Europe. And her custom house records show more arrivals and departures than were recorded at the ports of Boston and New York. No less astonishing was the growth of population. During these 20 years it increased from 4,479 to 109,260. In 1840 Chicago was the 30th city in rank of population; by the U. S. census of 1860 she held the ninth place, having outgrown 20 of her sister cities. She had also become the commercial center of America and by two-fold the largest grain exporting trade in the world. While Chicago early acquired the ascendency in the exportation of grain she also became the stock shipping center of America, and when the Michigan lumber traffic was at its height she received and exported more lumber, lath and shingles than any five cities of the United States.

During the fourth and fifth decades of the nineteenth century when the tide of emigration from the eastward and middle states was sweeping westward to adjacent states along the favored shores of the great lakes, their commerce-bearing waters were the main thoroughfare. A fleet of nearly two hundred passenger and freight steamers were in active service between Odgensburg, Chicago and intermediate ports, transporting westward implements of trade, home building and husbandry; also those hardy, progressive and dominant pioneers who reared prosperous cities and transformed the fertile valleys and broad prairies of the northwest into Eden-like fields, from which was freighted eastward to the markets of the world the products of a new agricultural domain surpassing in exportation the sea-girt empires of Europe.

While the growth of the lower lake commerce during this short period was the wonder of the age, the epoch of commercial greatness that has placed this nation first among the industrial powers began with the building of St. Mary's Falls canal and the locks which opened Lake Superior to commerce, thus linking the vast mineral deposits and forests of that region with the rich coal mines and factories of the east.

The development of commerce on Lake Superior was retarded by the St. Mary's rapids until the opening of the St. Mary's Falls canal in the summer of 1855. Prior to the opening freight was unloaded below the rapids and hauled about two miles with teams,

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then loaded into small vessels that had been hauled over the portage, none of which had a carrying capacity of over 70 tons. When the canal was opened to commerce the mercantile navy of Lake Superior consisted of nine small vessels and one small steam propeller with a total carrying capacity of about 700 tons.

The first cargo of iron ore shipped from Lake Superior ports direct to the lower lakes consisted of 132 tons laden on board the brig Columbia, which passed through the canal Aug. 17, 1855. This notable cargo was shipped from Marquette by the Cleveland Iron Mining Co., and its bill of lading was signed by Peter White as agent.

For 20 years the Marquette range held the distinction of shipping all of the iron ore that went forward from the lake region, and in 1876 the season shipment was 1,000,000 gross tons. For the purpose of comparison I will state that one gross ton of iron ore is equal to 30 bu. of wheat in water displacement, and the freight rates on ore and grain are usually made on that basis, ie., $1.00 per ton equals 3½c per bu. Therefore as a commodity of commerce 1,000,000 tons of ore is equivelant to 30,000,000 bu. of grain. So we find that in the same number of years the Marquette ore shipments grew in like proportion with the Chicago grain traffic. So far as America is concerned the benefit derived from the exportation of grain practically ceases when it reaches tidewater. But the iron ore is a sinew of the nation. Not a pound leaves her shores in its natural state. Every cargo floated down the lakes enters into some one or more of the diversified manufacturing industries that have made this country first in wealth and industrial progress and the favored home of 22,000,000 wage earners, whose annual pay roll is more than $14,000,000,000.

As before stated, prior to 1876, the Marquette range produced all the iron ore shipped from the lake region. Since that date there have been opened in the order given, the Menominee, Vermillion, Gogebic and Masaba ranges. The Masaba range is located on the northwest shores of Lake Superior in the state of Minnesota and made its first shipment of ore in 1892. Four years later this wonderful range of mineral wealth had gained supremacy and was the largest producer of iron ore in the Lake Superior district. The total shipments of iron ore from each range during the season of 1907 was as follows: Vermillion range, 1,685,276; Gogebic range, 3,637,907; Marquette range, 4,388,073; Menominee range, 4,964,728; Mesaba range, 27,492,949, and from miscellaneous mines, 76,146, making a total shipment from the Lake Snuperior district 42,245,070 gross tons, of which 65 per cent was shipped from the Mesaba range, and 35 per cent from the four older ranges. The vessel tonnage required in shipping to the lower lakes this enormous output of ore could, under the same conditions, carry 1,267,352,100 bu. of wheat—more than the entire wheat crop of the United States for three years preceding.

If the iron ore freighted down the Great Lakes during the season of 1907 could be loaded into gondolas (open freight cars in use for transporting ore and coal, which have a carrying capacity of about 30 tons), and the gondolas coupled together in one continuous train of cars, it would reach from the north pole, over the earth's surface, to the south pole and 600 miles further; a continuous train of gondolas 690 miles long would constitute car capacity for the annual production of pig iron in the Russian Empire.

The following statistics of commerce of the Great Lakes during the season of 1906 are taken from the MARINE REVIEW *Blue Book of American Shipping*, which is probably the best authority available for that season: Iron ore, net tons of 2,000 lbs., 43,294,907 tons; coal, anthracite and bituminous, 15,395,218 tons; grain, 289,929,614 bu., equivalent to 8,697,886 tons; lumber, 956,809,000 ft., equivalent to 1,450,209 tons; copper, from portage entry, 100,000 tons, making a total of 68,918,220 tons, of which the iron ore constituted 63 per cent. It is estmated that every ton of iron ore taken from the mines represents $9.00 to be paid to the wage earner during the course of its transformation into steel rails or plate. Therefore the shipment of last season will bring $380,205,630 to the laboring men of this country.

The development of commerce on the great lakes is without doubt the greatest blessing the world has ever conferred upon mankind. During the season of 1907 the magnificent passenger steamers of the great lakes transported more passengers than the trans-Atlantic lines of the United States, Great Britain, France and Germany, 68 per cent of which were pleasure seekers.

The aggregate tonnage of freight through the St. Mary's Falls canal this season is 48,000,000 tons for seven months' traffic, against 11,675,000 tons carried through the Suez canal in the past 12 months. The fleet of steel freighters now engaged in lake traffic have a carrying capacity of 4,000,000 tons in a single trip and has been built up in lake shipyards within the last 20 years at a cost of more than $200,000,000. During the two years ending Jan. 1, 1907, the shipyards of the great lakes turned out 80 steel steamers which have an average carrying capacity of 10,000 tons. The building of these ships alone represents an investment of $32,000,000, and since that date 40 of the same type have been ordered for delivery at the opening of navigation this season.

One of the most striking features in the development of lake commerce is the rapid handling of cargoes which has been made possible by the construction of docks and handling appliances particularly designed for each branch of the trade. There are now on Lakes Superior and Michigan 26 ore docks which have a total storage capacity of 1,253,000 gross tons. They are located as follows: Escanaba, 6; Marquette, 4; Ashland, 3; Two Harbors, 5; Duluth, 4; Superior, 3, and Gladstone, 1. These 26 docks were built expressly for handling iron ore, and cost approximately $18,200,000. A 10,000-ton cargo can be loaded from one of these docks in less than three hours and the same cargo is often unloaded at the discharging docks in less than six hours. The discharging docks are equipped with hoisting and conveying machinery designed especially for rapid work. It is not possible to give any reliable statement of the aggregate cost of these unloading facilities. It is more than probable, however, that the improvements made within the last 10 years have cost more than $50,000,000.

But more important than the tonnage increase or the enormous expenditure in handling facilities is the fact that the great lakes afford the lowest transportation charges in the world. During five years past the average cost of moving a ton of freight one mile on the lakes, as shown by government reports, has been eighty-six hundredths of a mill. The average freight rate on a ton of coal from Buffalo to Mason, a distance of 354 miles by rail, is $1.65. From Buffalo to Duluth, a distance of 993 miles by water, the last season's rate was 30 cents per ton, and wherever the rate is above 30 cents per ton it is because the waterways are not properly improved or the dock facilities are not modern.

The manufacturing industries of the east and the agricultural wealth in the west owe their success to the low transportation charges afforded by the great lakes. Our inland trade each year is in excess of the entire exports

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and imports of all the nations of the world, and the great lakes are the very center of its activity.

WORK OF WEATHER BUREAU.

Willis L. Moore, chief of the weather bureau, says the time is coming when ocean transportation will be far safer than riding on a street car is today. He made this statement to the committee on agriculture of the house of representatives, when he was called to explain the needs of his bureau during the coming fiscal year. Prof. Moore told the committee that it is only a matter of time when the governments of the world will compel every ship above a certain tonnage to carry a wireless instrument and operator, and require each ship to transmit all messages received by it. When this is done, he said, the danger of ocean travel will be greatly minimized.

This comment of the chief of the weather bureau was made in reply to a question asked by Representative Scott, of Kansas, chairman of the committee on agriculture. Mr. Scott wanted to know if, during the hurricane season, when messages were received from the West Indies and the Atlantic Coast, warnings were sent by the Weather Bureau to vessels passing along the coast.

Prof. Moore said this was done, the wireless telegraphy being under the control of the Navy Department. The wireless messages are flashed out, and vessels within a distance of 300 miles receive the warning. He declared that the competition of different wireless companies results in detriment and inconvenience, and that it is essential that the government step in and control the transmission and receipt of wireless messages. "We had a case a few years ago," he said, "of a ship that was disabled, and sent a wireless message, and it was received by a competing wireless company and was suppressed."

While he was not prepared to advocate the government ownership of wireless telegraphy systems, Prof. Moore said it was essential that the government should control these systems. When such control is exercised, he said, a storm will be located, and its direction shown to all vessels. "The message will go out," said Prof. Moore, "that a storm is centered along the south line of coast, moving along the Gulf Stream, increasing in intensity, and the vessel's master will say: 'We will sail around that.' When the time comes that we will get observations from the entire Atlantic Ocean by wireless telegraphy, through one ship repeating to another its observations, we will be able to send information to the entire Atlantic Ocean. Messages will be repeated backward from ship to ship, 'Storm in such part of the ocean. All else serene. Sail your course.' All ships outside of that region will feel easy, but everything coming into that region will have to look out. It will render ocean transportation far safer than riding on a street car is today."

Warnings of storms destructive to commerce on the ocean and on the Great Lakes are made with far greater accuracy than are the predictions of rain and snow, Prof. Moore said. "The predictions of rain and snow," he said, "are all that you see in the daily papers, and these warnings of storms, which go to direct the mariner, and are given by flags and special bulletins, are the most valuable part of our work."

CHICAGO'S HARBOR.

The harbor commission of Chicago has sent letters to 125 business men asking for suggestions relative to the improvement of Chicago's harbor facilities. Among the questions asked are the following:

Should the Chicago river be widened or straightened in excess of the plans of the sanitary district, and if so, how much?

Is some alternative route for a wide and straight channel connecting the drainage canal with the lake feasible? If so, where?

Should the functions of the Chicago river as a harbor be supplemented by one or more harbors on the lake front?

Will you submit to the harbor commission a plan, showing your views of an ideal harbor?

What class of tonnage do you think it is desirable to handle in the Chicago river, and what class in a harbor on the lake front?

What are your views regarding the facilities for transferring water-borne traffic to railroads or teams? What are your suggestions as to how this should be effected at a minimum expense, and where?

Is the transfer of traffic handled by lake steamers to river lighters feasible?

What kind of commerce would you expect Chicago to gain by improved harbor facilities?

ITEMS OF GENERAL INTEREST.

Barrett & Lawrence, of Philadelphia, eastern agents for the Nicholson Ship Log Co., received the contract to equip the Standard Oil Co.'s sea going tug Astral with the No. 1 Nicholson ship log. This makes the third installation made on board vessels of the Standard Oil Co., and the above concern is very busy making installations of the Nicholson log on board a large number of prominent steam yachts, and several of the new cruisers of the United States navy.

The tank steamer Oklahoma was launched from the yard of the New York Ship Building Co., Camden, N. J., last week for the Guffey Petroleum Co., and is intended for service between Philadelphia and Port Arthur, Texas.

The house committee on naval affairs agreed to an authorization for the construction of two steel floating dry docks, capable of holding a battleship of 20,000 tons, one to be located on the Atlantic and the other on the Pacific; and also the establishment of a naval station at Pearl Harbor.

Officials at the Mare Island navy yard are preparing for a period of great activity. Orders have been transmitted from Washington to prepare the yard to make repairs upon the battleship squadron which will shortly reach San Francisco. The squadron is a large one and repair work will be apportioned between the private yards at Frisco and the navy yards at Mare Island and Bremerton. Preparations are now being made for largely increasing the working force.

The New York Mallet & Handle Works, 743 East Eleventh street, New York, have been making mallets and handles for over 56 years. They are the inventors of the caulking mallets now used in all the ship yards of the United States. These mallets are durable and of superior quality.

The Eastern Business Men's Association, the marine trades and other kindred interests, are making a particular effort to have the army transport service brought back to the port of New York. During and after the war with Spain the army transports—at one time there were 52—were loaded and discharged at Brooklyn, giving employment to as many as 900 men daily, at times. Later the transport service headquarters was made at Newport News, Va., from which a semi-monthly service to Havana has been maintained. Most of the supplies shipped on board these vessels go from New York by rail and it is pointed out that the expenses of docking, wharfage, storehouses, etc., are much less at that port than at Newport News. It is expected that a formal appeal will be made to Secretary of War Taft before the end of the month. Norfolk, Baltimore and Boston are also reported to be anxious to obtain the transport sailings.

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THE CAUSES AND PREVENTION OF FIRE AT SEA.*

BY PROFESSOR VIVIAN B. LEWIS, F.I.C., F.C.S.

During the first five years of the present century fire at sea resulted in the total loss of 141 vessels, having a total tonnage of 162,594 tons, whilst the total number of fires would approximate to twenty times this number, and it is clear that the financial importance, entirely apart from the dread nature of the subject, demands all the attention we can give it. Three years ago Mr. Edwin O. Sachs, who, as chairman of the British Fire Prevention Committee, has a wide knowlede of fires on shore, read a paper before this society on "Fire Prevention on Board Ship;" but, although he gave much excellent advice as to precautionary measures, he left the chief causes of fire at sea untouched, and it is in hopes of adding something to your knowledge of this all-important subject that I venture to bring it forward again to-night.

The conditions existing on board ship differ so widely from those on land that ideas gleaned from fires on shore are somewhat misleading if taken in more than their general application. In shore fires we are largely dealing with dangers to the structure and fittings of dwelling houses, and it is only when we come to warehouse fires that any great analogy can be found with fires at sea.

Since the advent of iron and steel ships, risk from the structure is but small, and it is danger from fittings and cargo that becomes the first consideration, and this entirely alters the ratio of danger existing amongst the various causes of fire.

Taking the fire returns for 1904, in London, Liverpool, Manchester, Glasgow, Leeds, and Sheffield, we find that the chief ascertained causes of fire were:—Matches, 1695; overheating from defective flues and fireplaces, 853; gas, 464; oil lamps, 408; candles, 327. These amount to 80 per cent of the total fires; whilst these causes probably did not play any important part in 5 per cent of the fires taking place at sea.

In analyzing the statistics of the returns of losses by fire at sea, one finds, as might be expected, that the general cargo occupies the pride of place, whilst coal, fiber cargoes, like cotton and jute, petroleum and other oils, grain and timber, figure in the order named; but such statistics are somewhat misleading, as the number of ships carrying general cargo enormously outnumbered all others.

Statistics, however, do give us a clue as to the class of fires that are most dangerous when once started, if we tabulate the probable causes of fire and the total losses from these causes, we gain a valuable insight into what we may term the danger risk.

	Percentage of cause of fibres.	Percentage of total loss.
General cargo	51	64
Coal	10	20
Oil	7	10
Cotton and jute.....	32	6
	100	100

These figures certainly seem to show that a fire on a ship freighted with coal or oil is the most dangerous when once started, whilst the general cargo comes next, and that fires in a cargo of fibre, although bulking largely in occurence, are the least dangerous to the life of the ship.

There are three causes which overshadow all others in leading to disaster from fire, and these are:—(1) Spontaneous ignition taking place in a homogeneous cargo, or in one unit of a mixed cargo. (2) The unwitting admixture in a general cargo of substances liable to raise the temperature to the ignition point by chemical action on each other. (3) The carriage of substances liable to give off inflammable fumes or vapors, which, igniting some distance from the cargo itself, cause explosion and fire.

The best known example of the first cause is the spontaneous ignition of coal cargoes, and this I dealt with so fully in a paper I had the honor of reading before this Institution in 1890, that I cannot do better than refer you to it for further information, although I shall have to revert to the subject in dealing with its prevention, and the methods employed in the extinction of such fires.

All fibrous structures when closely packed in bulk are liable, when slightly moist and subjected to pressure from the weight of material stored above, to undergo heating, and if a trace of oil or fatty matter be present, this heating becomes so excessive as to often lead to spontaneous ignition. Of the ordinary fibers, cotton, jute, flax, ramine, and hemp are more dangerous than animal fibers, like wool and silk, this being due to the fact that the vegetable fibers really consist of microscopic tubes, which contain the necessary amount of air to set up oxidation processes, all of which emit heat, whilst wool and silk being practically solid do not themselves contain air, although in packing it is impossible to avoid the presence of air in the spaces between the fibers, and under certain conditions this leads to heating. The extraordinary effect which the smallest trace of animal or vegetable oil has in inciting this action and increasing it to the point of ignition of the mass is thoroughly recognized, and is due to both oil and fibre.

It is well known that some oils have the property of drying more rapidly than others, and that if a powdered pigment be mixed with boiled linseed oil the paint so formed will harden and dry in a few hours, whilst if ordinary lamp oil be employed no drying action would take place. The drying of oils is due to the power which they possess of taking oxygen from the air and becoming converted into resins, the change from the liquid oil to the solid resin causing the hardening. This process, however, like all processes of oxidation, gives rise to heat, which, although it escapes our notice when taking place in the drying of paint spread over a considerable surface exposed to air, yet makes itself very manifest when the oil in a fine state of division is spread over the surface of such non-conducting materials as cotton or other fabrics of a similar character, and it only needs a few pounds of such materials to be allowed to collect in a heap for ignition to follow in a comparatively short space of time. Jute offers the same dangers as cotton when in bulk, and when oiled, spontaneous ignition sometimes occurs even more easily than with cotton; whilst the same danger is found when the jute is in a thoroughly dry condition, and exposed to moderate warmth from a steam pipe or flue, or even the rays of the sun. Even wool when compressed in bales becomes dangerous when slightly moistened by rain during making up, although spontaneous ignition does not often result.

Not only does danger from spontaneous ignition exist in the fibrous structures when in the raw condition, but fabrics made from them, if oiled or greased, are actively dangerous in even small quantity, a package of oiled silk umbrella cases having been known to ignite a general cargo. Oils and fats vary very much in their power of heating when spread on the surface of vegetable fibers, linseed oil being the most dangerous, whilst mineral oils are not only themselves practically harmless, but when mixed with animal oils retard their action.

Another danger with such cargoes of fibrous material is that they are often very dusty, and the dust is so inflammable that when mixed with air a spark from the impact of the iron bands on the bale or the nails in a stevedore's boot striking on an angle iron is enough to cause ignition, and a flame will run through the dusty air as easily as through an explosive gaseous mixture.

* Read at the meetings of the forty-eighth session of the Institution of Naval Architects.

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It must always be clearly borne in mind that, although the ignition point of a substance is an unalterable temperature both for the mass and particles from that mass, yet it is far easier to heat the substance in a fine state of division to the required temperature than to raise the temperature of the large mass.

For instance, iron ignites at about 1500 degs., C., and gunpowder at a little over 250 degs. C., yet if some alcohol in a dish be ignited, and finely-divided iron dust be thrown into it, the iron burns brilliantly in the flame, whilst grains of gunpowder may be thrown through the flame without ignition, and will remain unacted upon in the alcohol until it is nearly all burnt away, when the flame, burning down to them and being in contact with them for some time, heats them to the necessary temperature, and so ignites them. In the same way a very small flame held in contact with a block of wood fails to ignite it, whilst a splint or shaving cut from the block is easily ignited by the same flame.

In a general cargo the chance of fire from the chemical actions brought about by the mixing of substances that have leaked from various packages during heavy weather is a very prolific cause of fire, and one which could only be avoided by a deep knowledge of the scientific side of the question, many apparently harmless substances causing fierce combustion when mixed.

It would be impossible to deal with all possible causes in a general paper, but I may point out one or two unexpected actions of this character, which have come under my own observation.

Permanganate of potash is a crystalline body, which, dissolved in water, gives the disinfectant known as "Condy's Fluid," and owes its valuable cleansing and antiseptic properties to its power of giving up oxygen to oxidizable compounds. Glycerine, on the other hand, is the sweet, oily liquid so largely used for toilet preparations, and no one would for a moment look upon the shipment of them amongst a general cargo as a source of danger, but should a bottle of glycerine crack and the liquid flow on to a package of permanganate of potash, the result is a combustion so fierce that the combustible portions of the cargo would become involved.

Again, rope and other material treated with tar and turpentine is often found in a general cargo, and I investigated a case in which chlorine gas envolved from some barrels of bleaching powder in the same hold caused a serious fire, by its action on the turpentine in some rope waste. Nitric acid leaking on to turpentine, charcoal, or other carbonaceous material, causes fire, whilst the breaking of a carboy of sulphuric acid would lead to serious trouble in very many cases. It is impossible in a mixed cargo, the contents of which are rarely known to the stevedore, to avoid danger, and all that can be done is to avoid as far as possible packing bodies rich in oxygen in the same hold as easily oxidizable material.

The third cause of fire is the formation of combustible vapors from easily volatile bodies, these vapors either finding their way through a leaky bulkhead to some source of fire, igniting and burning back to the source from which they sprang, or else forming an explosive mixture with the air in the hold. This has been the cause of most cases of fire in oil ships in which crude mineral oil or petroleum spirit was being carried. When the oil comes from the well it consists of a mixture of a large number of different hydrocarbons, some of them, like petrol or petroleum spirit, being excessively volatile, and giving off inflammable vapor well below the ordinary air temperature, whilst others, again, have to be heated to a certain temperature before any inflammable vapor is developed. The temperature at which such vapor comes off is termed its flash point, whilst the firing or ignition point of the oil is generally well above this. It is the flash point, however, which is the factor of danger, as, if it be too low, vapors capable of yielding explosive mixtures with air are given off and are liable to cause very serious trouble.

One of the greatest dangers with the vapor of volatile hydrocarbons is that the great weight of the vapor as compared with air will cause it to creep along surfaces for very long distances, and then on reaching a light the flame flashes back along the vapor to the source from which it sprang. It may be accepted that the transport and storage of refined lamp oils and residuum are practically free from danger, the only point to be guarded against being the ignition of the liquids in volume during fires, whilst the real dangers to be guarded against are to be found in the transport and storage of crude oils containing highly-volatile constituents, and with petroleum spirit.

Besides the causes of fire I have enumerated, there, of course, exist those inseparable from the careless use of lights, smoking, electrical dangers, and many others, which, however, sink into comparative insignificance as compared with the three primary causes. The question now arises as to the practically possible precautions that can be taken to minimize the occurrence of fire at sea, and it was this portion of the subject that Mr. Sachs dealt with in his 1904 paper, and his recommendations may be briefly summarized as:—(1) Constructional safeguards, consisting of subdividing the hold into smaller compartments than usual, and employing fireproofed wood. (2) Safeguards of equipment, consisting of protecting all steam pipes, and taking all possible precautions with the electrical wiring of the ship. (3) Administrative safeguards, consisting of care in stowing cargo, proper inspection by patrols, and better fire equipment.

Excellent as these points are, many of them are not practicable under the conditions existing in the Mercantile Marine, and the subdivision of the cargo holds into smaller compartments, both from the point of view of expense and efficient handling of the cargo, would certainly not recommend itself to the naval architect.

The use of flame-proof wood, so strongly advocated by Mr. Sachs, is undoubtedly a reform in shipbuilding which is urgently needed, and the fact that it has not yet been adopted is due, not to lethargy on the part of the naval architect, not to any minimizing of the advantages that are to be obtained by the use of non-inflammable material, but to the simple fact that up to a short time ago the preparation of the wood had not reached that stage of perfection which would have justified the expense of adopting it. The idea of making timber fire-proof is no new departure, as more than three hundred years ago attempts were first made to render timber used for shipbuilding fire-proof, and from that time down to the present it has cropped up from time to time; perhaps the most notable attempts being those made by Sir Humphrey Davy and by Faraday to solve the problem. All these attempts failed owing to the idea not being grasped that the protecting ingredients must be got into the structure of the wood itself, and must permeate it to the core before it is possible to obtain any satisfactory result, and the fact that, although this could be easily done on the experimental scale in the laboratory, the great difficulties which stood in the way of doing it on the large scale led to failure in all the attempts. The cause of these failures is not far to seek. Impregnation of a most thorough character is a necessity, but every kind of wood has to be treated in a different way in order to meet the requirements of the varying densities, and as this depends not only upon the kind of wood, but also on the age

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of the timber and the character of the soil on which it grew, not only had the process to be varied with different specimens of timber, but also for different samples of the same timber, when grown under different conditions, these being points which only now have come to be recognized.

A wide variety of substances have been suggested for fire-proofing, and the salts employed are now generally spoken of as "anti-pyrenes," but many of these have been found to be unsuitable, owing either to their action upon the wood or upon the materials which had to be used with it. One of the popular substances in the early experiments was common salt, but it was soon found that the timber impregnated with this could not be commercially used because of its hygroscopic properties. Other substances then employed to effect the fire-proofing were found to rot the wood, whilst some of them very rapidly corroded the nails and screws used with the impregnated timber. Other chemicals again, although they might do the required work for a short space of time, volatilized and left the timber as inflammable as it was before. Practical experience has narrowed the list of efficacious compounds to ammonium chloride, ammonium phosphate, ammonium sulphate, calcium chloride, magnesium chloride, zinc chloride, zinc sulphate, stannous chloride, alum, borax, boracic acid, and aluminum hydrate.

In making the wood non-flammable, the timber is run on small trolleys into a large cylinder in which, by means of a vacuum, all air and moisture are extracted from the cells of the wood, and the solution of the chemicals is then run in. The contents of the cylinder are placed under hydraulic pressure, carefully regulated accordng to the character of the wood, as a pressure which is needed by one kind of wood would crush and destroy the cells of another. Indeed, the success of the whole process depends upon minutiæ of this kind, and the placing on the market of improperly treated wood has created a prejudice against such processes that has done much to retard its introduction. After impregnation, the completion of which is indicated by the gage glass on the cylinder showing that the right proportion of the liquid has been absorbed, the wood is removed, drained, and dried at a carefully-regulated temperature, this again having a great influence on the quality of the finish wood, temperatures above 85 degs. F. tending to render many kinds of wood brittle, whilst when dried at the right temperature the wood not only retains all its original qualities, with the exception of inflammability, but is thoroughly seasoned and ready for the joiner's shop.

Made in this way non-flammable wood is a perfect building material, has no effect upon the workmen's tools, as was the case when the earlier anti-pyrenes were used, and will take paint, stains, varnish, and other decorative treatment as well as it did before fire-proofing. It now combines the advantages of excessively low conductivity with a great power of resisting fire, and entire freedom from spreading fire. This effect is caused by the chemicals used, consisting chiefly of ammonium phosphate and boracic acid, which, during treatment, crystallize in the cells of the wood, and can, therefore, never be removed. Under the influence of heat the ammonium phosphate decomposes to ammonia gas and phosphoric acid, the former driving all air out of the cells and replacing it by a non-flammable gas, whilst the phosphoric and boracic acids fuse and coat the cell walls with a glaze which, whilst allowing the gases from the decomposing cellulose to escape, prevents the access of oxygen from the air to carry on further combustion.

Unfortunately for the rapid advancement of flame-proof wood it was placed upon the market before it was perfected, and although the Admiralty were quite willing to take it up warmly, some slight trouble was found in the installation on the Royal yacht, the wood not having been dried in the yard at the right temperature before use. As soon, however, as this was discovered and rectified, the results were found to be perfectly satisfactory, and a further modification introduced since that time eliminates what seems to be the last of the troubles standing in the way of its wide adoption. Nearly all the European powers are either experiencing with it or considering its adoption, and I am informed that all the woodwork on the new Italian ironclad Roma will be of this character. In the new ships of our own navy, wood has been used as little as possible, and comfort has to a great extent disappeared with it.

I am in entire accord with Mr. Sachs when he pleads that the use of fireproof wood on all passenger steamers should be made compulsory, and it seems to me that at the present moment, when competition between the ocean lines is so keen, and every bid is made for the passenger traffic, the line which is wise enough to first see the importance of doing so, will secure for itself an advertisement that will pay the extra cost many times over.

I have my own views, however, on the way in which this should be carried out, and should never dream of advocating that a ship builder should be dependent upon any outside firm for the prepared wood. An apparatus for treating the wood should be installed at all large ship building establishments, and the wood treated there, in order to prevent delays in delivery during the building of the ship. The cost of treatment nearly doubles the price of a cheap wood, but although this sounds almost prohibitive, it represents a very small percentage on the total cost of the ship; and it must be remembered that with a liner subsidized for use as a fast cruiser in time of war, there is timber enough in her top works to ensure its being fired by a very few hits from the enemy's shell. By doing away with this danger by the use of properly-treated wood, her value for such work should be enormously increased.

It seems to me that the whole onus of the introduction of a safeguard of this kind rests with the owner; no ship builder would take the initiative, as he looks upon his present burdens as quite sufficient for his own needs, and unless the use of flameproof wood is specified, no advance will be made in this direction.

With the introduction of treated wood, the risks of overheating by steam pipes, and faults in electric installations, are minimized. Electricty has been responsible for many disastrous fires. Although one might consider it to be the safest form of illumination, as there is no inflammable liquid to spill, or gas to form explosive mixtures with air, yet defective cables and fittings have been a fruitful source of accidents. An excess of current may cause a leak in a weak part of a cable, and the short circuiting causing heat, the bituminous envelope of the cable is decomposed with the evolution of inflammable gases, which ignite by the spark and produce flame. A spark from the carbon of an arc lamp falling on inflammable material will start a conflagration, and many fires have been traced to the bulb of an incandescent electric light having been laid on textile fabrics, etc. In the last case the fabric soon begins to char, and in a very short time bursts into flames.

When a fire is once well started, the means that can be adopted for its extinction may be either by lowering the temperature of the burning mass below the point necessary for the continuance of the combustion, or else by cutting off all access of air, and so depriving the combustion of the oxygen necessary for its support. To the first method belong the means usually adopted for extinguishing a fire, namely, that of pouring a large volume of water upon it. In doing so, several actions are brought into play. In the first place the temperature is reduced below the point of ignition,

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owing to the large amount of heat absorbed by the water, and secondly, as the water is heated up to its boiling point, an enormous volume of steam is generated which drives the air away from the burning material. It may be stated roughly that about 5 lbs. of water will require the combustion of 1 lb. of well-dried wood to effect its conversion into steam; and as in a fire it is only the surface of the wood that is undergoing combustion, the effect of the 5 lbs. of water will be felt over a considerable area. The steam generated occupies a volume about 1,700 times as great as that of the original water, and as steam does not support combustion in the ordinary sense, the evolution of this enormous quantity of gaseous matter serves to drive off the oxygen of the air from the neighborhood of the combustion, and so brings it to an end. The damage done to a mixed cargo by playing water into the hold makes it anything but a favorite method of extinction with the ship owner, and blowing steam into the hold when fire takes place is often adopted, in order to drive out air and so smother combustion.

I must confess I have a strong prejudice against the use of either water or steam for coping with a fierce fire in a ship's hold, as under certain conditions they may give rise to troubles as bad as those they are intended to cure. Take, for example, a fire in a coal cargo. There is a mass of coal in the hold, with a pocket of incandescent coal near the bottom; the difficulty is in the first place to get at it, and the first impulse is to pump water in and let it find its way to the seat of the combustion. The water, however, cannot get freely to it in quantity, having to filter its way down through the interstices of the coal, meeting as it does so the hot products of combustion, and being evaporated off in cooling these down. The portion that does reach the seat of the combustion, on coming into contact with the red-hot mass of carbon, is largely converted into water gas, a mixture of carbon monoxide and hydrogen, which only requires a small proportion of air to convert it into a highly-explosive mixture. This, collecting under the decks, explodes, ripping up the deck and blowing off the hatches, thus letting in free access of air to carry on the combustion, which generally leads to the total loss of the ship.

It is even more difficult to get steam to the required spot, and steam, like water, is decomposed into water gas by incandescent carbon. The cooling action that steam has upon the burning mass is far less than would be the case with water, the chief value of which as an extinguishing agent is the large amount of heat rendered latent during its vaporization.

There are certain gases, however, which have a great power of stopping combustion by keeping away the oxygen of the air from the burning substance, and some of these have been proposed for the extinction of such fires. If we burn sulphur in oxygen the gas sulphur dioxide with its choking smell is generated, and this gas has a powerful effect in preventing and extinguishing fire, a small percentage of it being sufficient to extinguish flame. The action of it, however, is purely extinctive, and in no way cooling, and with a cargo on fire the cooling down of the mass is every whit as important as the extinction of the active combustion. Another gas which acts in precisely the same way is carbon dioxide; but here again, if carbon dioxide is merely generated, and pumped into the area containing the burning matter, no absolute cooling is effected, and although the use of these gases was suggested over 30 years ago, it was this trouble which prevented their adoption.

Some 17 years ago I pointed out that with a proper arrangement of apparatus carbon dioxide could be made not only a most valuable extinctive agent, but also one of the most powerful cooling materials one could obtain. When carbon dioxide is compressed under a pressure of 36 atmospheres at a temperature of 0 degree Cent. (32 degrees Fahr.), it is condensed to the liquid state, and can be stored in steel vessels with screw valves. On opening the valve some of the liquid is ejected into the air, and being reduced to the ordinary pressure, is almost instantaneously converted into a large volume of gas. Conversion from the liquid to the gaseous state means the absorption of a large amount of heat, and so great is this that everything near the stream of new-born gas is cooled down, and some of the escaping liquid is frozen to a solid, having a temperature of —78 degrees Cent. (—108.4 degrees Fahr.). The liquid carbon dioxide is now an everyday article of commerce, and is used to a large extent for aerating waters, driving torpedoes, and for freezing machines.

In the paper on "The Spontaneous Combustion of Coal," which I read before the institution in 1890, I made certain suggestions as to the way in which the liquid gas might be utilized. This proposition, however, was never taken up, partly because there was a fear that, under the influence of heat, the cylinders might explode; but if they had been made in the same way as those used for the compressed hydrogen employed in military balloons, there would have been no fear of a shattering explosion; the worst that would have happened would have been a ripping up of the cylinder along the weld of the seam, which would have done no harm, but would have been extremely efficacious in at once putting out the fire. Several firms have, however, adopted the idea, both for the protection of coal cargoes and stores containing such goods as cotton, jute, or wool in bales, in which it would be extremely difficult to get at the fire by any other means. In most of these cases the cylinders are arranged externally to the store, and the gas only turned on when a fire is discovered.

It must be remembered that with the use of sulphur dioxide, instead of carbon dioxide, the same cooling effect would never be attained, and that the gas is so irrespirable that four parts in 10,000 render air incapable of being breathed; whilst with carbon dioxide, although three to four per cent will extinguish flame, a man can breathe for some time an atmosphere containing over 10 per cent without danger.

Prevention is, after all, better than cure, and if a small extra cost in construction were faced, there never need be another cargo fire on steamers carrying cargo from one port to another; but the suggestion would not be applicable to tramp steamers breaking cargo at various ports of call. To ensure this safety, all that is necessary is to abolish any attempt at ventilation for the cargo space, make the hold gas-tight, and carry the cargo in an atmosphere of carbon dioxide, whilst any oxidizing materials, like nitrate would be carried in a separate hold. In order to make safety steamers for carrying cargoes in large bulk, I should propose to make the holds larger rather than smaller, and to put in a double watertight bulkhead at each end of the cargo space, filling in the space in the end bulkheads either with water or heavy fuel oil, so as to render the hold gas-tight. The hatches would be closed by iron covers, fitting into annular water seals, these covers being raised or lowered by the crane when required.

On loading a dangerous cargo, say, Indian coal during the hot season, when the cargo was all in and trimmed, a tarpaulin would be put over the hatch of the hold to be treated, and, one corner being raised, a hose would be lowered into the hold so as to reach the surface of the coal. Through this hose carbon dioxide, generated by the action of hydrochloric acid on chalk (calcium carbonate) or other cheap carbonate in a movable apparatus on the quay-side, would be passed, so as to drive out all air from the hold, and when a light held inside the hatch was extinguished, the hose and tarpaulin would be re-

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moved, and the cover lowered into position, thus making the hold gas-tight. Under these conditions the most dangerous cargo could with safety be carried in an atmosphere of carbon dioxide, as there would be nothing to cause or support combustion, and should gas be generated from a coal cargo, so as to create pressure in the hold, it would blow the light water-seal of the hatch cover, and so relieve the pressure. In this way, not only coal, but crude oil, petrol, and any dangerous cargo could be carried without risk.

On reaching the port of discharge the hatch cover would be raised, and air from a blower forced down through the hose, escaping as low down in the hold as possible, and this, after an hour's blowing, would mingle with and displace the carbon dioxide, and any gas that might have been formed, and when a safety lamp lowered into the hold burnt brightly, it would be safe for men to descend and commence the discharge, the air current being kept going all the time.

I am quite aware that the difficulty of making a bulkhead watertight is considerable, but I have too much respect for the engineering skill of the members of the institution to even suggest that it is impracticable, and if the big carrying lines had one or two vessels so fitted for the carriage of dangerous cargo, they would easily recoup the initial expense.

The amount of gas needed to fill up the space not occupied by cargo would be comparatively small, and although the supporters of existing systems would talk of the langer of leakage of the gas into the working and living parts of the ship, such danger is practically nil. Any such leakage would be brought about by straining of the bulkhead during heavy weather, and the liquid would have to leak out before any gas could escape, which would probably lead to the detection of the trouble; but, even if this were not so, there is no danger in the slow leakage of the gas, as it would practically escape by diffusion, and the increase in quantity in the living portions of the ship, even under the worst conditions of ventilation, would be extremely small, and as candle and lamp flames are extinguished before health is affected by mixtures of carbon dioxide with air, should a serious leakage occur, attention would probably be called to it by this fact.

In passenger vessels, chemical extinctors, which throw a mixture of saline solution and carbon dioxide, would be of great value for extinguishing small fires occurring in bedding, draperies and fittings, but they have not been adopted because, as ordinarily made, their use necessitates the carriage of mineral acids; it is, however, perfectly easy to make them without the use of objectionable acids, and so obviate this trouble, whilst the use of non-flammable wood for all fittings would give a degree of safety never yet attained.

In conclusion, I have to apologize for the length to which this paper has extended, and to hope that some points of interest and use may be found in it by those desirous of decreasing the risks of the sea.

DULUTH-SUPERIOR COMMERCE.

Major Graham D. Fitch, government engineer, has just issued his report of the marine commerce of Duluth and Superior for the calendar year 1907. July is usually the heaviest month of the year, but in 1907 it was less than June and August, the cause being the labor strike in the iron ranges which stopped shipments of ore for 15 days during July.

Hard coal shipments show an increase of 280,455 tons over 1906, and soft coal an increase of 1,432,184 tons. Iron ore shows an increase of 4,222,783 tons over 1906. Wheat and other grain shows a decrease of 6,239,442 bu., with an increase in valuation of $11,916,161 over 1906, due to the higher prices prevailing for all kinds of grain during 1907. The average number of tons of freight shipped per day from Duluth and Superior was 115,166 tons. The navigation season covered a period of 234 days. This is reckoned from the first departure or arrival to the last departure or arrival to or from the lower lakes. It is understood of course that the open season for Duluth-Superior harbor to and from Lake Superior ports only was much longer, some local boats running all but two months of the year. The largest cargo entering Duluth-Superior harbor was carried by the steamer W. M. Mills, consisting of 12,680 net tons of soft coal. The largest cargo leaving the harbor was carried by the steamer Wm. B. Kerr, consisting of 13,712 net tons of iron ore. The largest cargo of grain was carried by the steamer L. S. DeGraff, consisting of 422,000 bu of wheat, weighing 12,660 tons. It is interesting to note that there is a large increase in tonnage but a falling off in the number of arrivals and departures, showing clearly how fast the smaller craft is being replaced by the larger.

The first boat to enter the harbor from the lower lakes arrived on April 26, being the first of a fleet of 135 boats which had been imprisoned in the ice in Whitefish Bay at the eastern end of the lake. Major Fitch accompanies his report with a photograph showing a large number of the vessels of this fleet at anchor in the harbor basin awaiting their turn at the docks. The total receipts of Duluth-Superior harbor were 7,840,023 tons, valued at $95,702,839. The total shipments were 26,946,682 tons, valued at $191,826,855.

CALENDARS.

S. Hemmenway & Son, 54 and 55 South street, New York, the well-known firm of sailmakers, are distributing an attractive calendar to the trade, upon which is a splendid reproduction of the painting, "Sundown," by W. E. Norton, the successful depicter of marine subjects. "Sundown" shows a parcel of merchantmen off Boston harbor. In the foreground is a schooner-rigged vessel, while behind her, the setting sun showing red upon her prow, comes one of the old square-rigged ships which some 100 years ago carried the commerce of America to every corner of the globe. One can almost feel the cool breeze over the sea and the swish of the water along the sides of the vessel.

The Ashton Valve Co., 271 Franklin street, Boston, Mass., have just put out an attractive calendar on which they incidentally advertise their high grade pop safety valves and steam gages. The pictorial part of the calendar is entitled "The Winner," and she certainly is. This is a copyrighted photograph by S. S. Porter of a girl in a yachting suit steering a yacht. It is one of the rare instances of a really beautiful pictorial effect being obtained by the use of a living model.

Major H. Jervey, government engineer at Mobile, Ala., recently opened bids for the construction of two wooden hull stern-wheel snag boats for use in his district. The bidders were:

Gulf Dry Dock Co., Mobile, Ala.	$38,500
J. M. Hammitt, Marietta, O.	41,200
E. J. Howard, Jeffersonville, Ind.	38,000

Contract was awarded to E. J. Howard. The general dimensions of the boats are 119 ft. over fantails, 100 ft. from bow to transom, 28 ft. beam, 5 ft. deep. The engines are of the usual western river type supplied with steam from two cylindrical boilers of the two flue type, 24 ft. long.

George W. Smith has been appointed agent of the Anchor Line at Minneapolis, Minn., in place of C. A. Clawson, deceased.

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QUESTIONS FOR MASTERS AND MATES.—NO. 62.

803. Course N 34° E, distance 75 miles; how much difference latitude and departure, and which way?

804. How much difference of longitude will 85 miles of departure make on the parallel of 45°?

805. What is the length of a degree of longitude on the parallel of 45°?

806. On which parallel of latitude will 60 nautical miles measure 2°?

807. A ship makes 83 miles of departure between the parallels of 42° and 46°; how much has she changed her longitude?

808. A ship changes her longitude 1° 30′ on the parallel of 42°; how many miles of departure has she made?

809. A ship sails from Lat. 32° 18′ N on a course between N and W, a distance of 344 miles and a departure of 103 miles. Find the course and the latitude reached?

810. The diff. lat. is 78.5 and the dep. is 32.5; what is the course and distance?

811. The diff. lat. is 32.5 and the dep. is 78.5; what is course and distance?

ANSWERS TO QUESTIONS FOR WHEELSMEN AND WATCHMEN.

401. Because N and S are zero on the compass card. These points form the meridian of the compass. All direction is measured from the true meridian on the earth, and the meridian of the compass is supposed to coincide with this meridian.

402. East and West.

403. Two.

404. Four.

405. Four.

406. 2,240 lbs.

407. 2,000 lbs.

408. Multiply gross tons by 1.12.

409. Multiply net tons by 0.89.

410. 56° 15′.

411. 42,560 ft.

412. 10 points.

QUESTIONS FOR WHEELSMEN AND WATCHMEN.

424. True bearing is N½E, Var. ½-pt. Ely, and compass bearing is N½E; how much and which way is the Dev.?

425. The correct magnetic bearing is NNE and the compass bearing is NE by N; how much and which way is the Dev.?

426. The true bearing of a range is NW⅜W, Var. 4° Wly, and with the ship on this range compass reads NW½N; how much and which way is the Dev.?

427. The true course is SE½S, Var. ¾-pt. Ely, and Dev. ¼-pt. Wly; what is the compass course?

428. The course steered by compass is SSE, Dev. ½-pt. Ely, Var. Dev. 1½-pts. Wly; what is the true course the ship is steering?

429. What is the difference between a true course and a correct magnetic course?

430. The true course is SW½W and the correct magnetic course is SW; how much and which way is the Var.?

431. The correct magnetic course is WNW, and the compass course is WNW½W; how much and which way is the Dev.?

432. The compass bearing of a lighthouse is NW½ N, Dev. ¾-pt. Ely, and the Var. ¼-pt. Ely; what is the true bearing of the lighthouse?

433. What is the difference between a correct magnetic bearing and a compass bearing?

AROUND THE GREAT LAKES.

Capt. Charles B. Crawford, for many years in the car ferry service of the Michigan Central railroad at Detroit, died recently.

Capt. W. H. Ellery and R. F. Kunzie, of Detroit, have purchased the steamer Benton from H. N. Jex, of Toledo, and will convert her into a sand steamer.

The new steamer Alexis W. Thompson, building for W. H. Becker, of Cleveland, will be launched at the Bay City yard of the American Ship Building Co. on Saturday.

The schooner D. P. Rhodes, now at Detroit, has been seized by the United States marshal on a libel of $27 filed by the Port Huron & Sarnia Ferry Co. The boat is owned by Capt. Thomas McGowan, of Detroit.

Navigation was opened at Conneaut this week when the car ferry No. 2 and collier No. 1 left on their first trip of the season to Canada. The vessels are owned and operated by the Marquette & Bessemer Dock & Navigation Co.

The Canadian government has given notice that a hand fog horn has been established at Providence Bay light station, southern shore of Manitoulin Island, Lake Huron; approximate position, latitude 45° 39′ 5″ N; longitude 82° 16′ 22″.

Mr. Frank J. Smith, formerly superintendent of the Open River Transportation Co., Portland, Ore., is compiling a list of every steamboat that has ever served on the Willamette, Columbia and Snake rivers. When completed this will make an excellent work of reference.

SHIP YARD NOTES.

The steamer Nann Smith, built by the Newport News Ship Building & Dry Dock Co., Newport News, Va., for the C. A. Smith Lumber Co., Marshfield, Ore., is now en route from Baltimore to her owners. This steamer will be the largest lumber carrier on the Pacific, and is 295 ft. 6 in. long, 43 ft. beam molded, 21 ft. depth molded. She will carry 2,225,000 ft. of lumber and will be used exclusively by the Smith company in transporting lumber from Coos Bay.

The first of the two suction dredges building for government work in New York harbor was launched at the yard of the Maryland Steel Co., Sparrow's Point, Md., and was christened by Hope C. Peters, daughter of Richard Peters, sales agent of the Pennsylvania Steel Co. She was named the Raritan. This dredge is constructed of steel throughout and was designed by Major J. C. Sanford. The Raritan is 290 ft. over all, 274 ft. between perpendiculars, 47 ft. 6 in. beam and 28 ft. deep. The dredging machinery consists of two 20-in. suction pumps, the bins having a capacity of 2,000 cu. yds.

Major Wm. Harts, government engineer, Nashville, Tenn., opened bids for the construction of two wooden hull steam tenders. The Charles Barnes Co., Cincinnati, O., bid $13,640 for each, and Ed. J. Howard, Jeffersonville, Ind., $11,835 for each. Howard later reduced his bid to $10,000 each by omitting electric light plant and steam capstan and substituting therefore a B B Providence power plant and oil headlights. This modified bid was accepted. These tenders are to be 100 ft. long, 20 ft. beam and 3 ft. deep, of the stern-wheel type with model bow, easy rake at stern, with three balanced rudders having iron rudder stocks carried on ball bearings. The tenders are to have one pair of stern wheel engines with cylinders 9 inches in diameter and 36 inches stroke, supplied with steam from boilers 14 ft. long and 36 in. diameter.

Bids were opened at Milwaukee recently for the construction of the foundation of the lighthouse to be erected on White Shoal Rock, Lake Michigan. The bidders were the Great Lakes Dredge & Dock Co., Chicago, $109,900; Adolph Green, Green Bay, Wis., $119,636; General Construction Co., Milwaukee, $232,518; W. H. Gillen, Milwaukee, Wis., $129,800, and the Edward Gillen Dock, Dredge & Construction Co., Racine, Wis., $93,785.60. Contract will be awarded to the Gillen Construction Co.

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OCEAN MAIL BILL.

Senator Chauncey M. Depew made a speech in the United States senate recently setting forth very lucidly the necessity of aid to the American merchant marine in the foreign trade. He earnestly advocated a liberal policy of subsidies to the end that the United States might have a fleet of auxiliary cruisers and a merchant marine as good as that of any other country in the world. It is a singular fact that this question has been before congress for the past 50 years and while it has received temporary attention and some support, nevertheless of late years every effort which would practically put an American merchant marine upon the ocean has failed. The word subsidy appears to have become an epithet of political reproach. To secure any consideration for the system it has to be called by other names. "To increase the efficiency of the postal service" seems still permissible in political discussions. That our position upon both the Atlantic and Pacific oceans is lamentable is admitted by everyone. Congress has so evaded the real issue from year to year that the American people are annually paying $200,000,000 to foreign ships for the carriage of over-sea products.

The ocean mail bill now before the senate reduces the proposition to its simplest terms. In 1891 a bill was passed granting $4 a mile outward-bound for the carriage of mails to 20-knot ships and $2 to 16-knot ships. Under that bill four steamships were put on the Atlantic ocean and good lines projected to the West Indies. Fifteen American steamers were built and entered into the trade of the Pacific ocean at $2 a mile. These ships had to compete first with the subsidized ships of Great Britain and Germany and lastly those of Japan. They were struggling, however, against something quite as serious as foreign subsidies. The $2 a mile carried with it the requirement that the ship be American-built, manned by Americans, and run according to American laws. The result was that the food and wage scale of the American ships on the Pacific worked out nearly double that of European and Japanese steamers. This unequal contest had its inevitable end. Of the 15 ships seven have been laid off and sold. The law of 1891 as originally drafted provided for a $6 a mile mail pay for 20-knot steamers and $4 for 16-knot steamers. This scheduled was changed in the house to its present rate of $4 and $2.

Senator Depew paid a tribute to the broad, enlightened and practical inspiration of the southern statesmen who controlled the government of the United States in the middle part of the last century. They projected a general system which if steadfastly followed out would have resulted today in a magnificent merchant marine. During the administration of President Polk it was so near perfect that American capital felt safe in embarking upon the competition of the ocean and the steamships called the Collings line were built. They soon gained the record for speed and increased the name and fame of American steamships. The result was that American ships were carrying one-half American tonnage and had reduced freight rates from $35 to $20 a ton. In the early 50s a feeling hostile to government encouragement to the American merchant marine was projected with the result that subsidies were withdrawn. Coincident with this England increased her subsidies. The American line went into bankruptcy and the ships were purchased by Great Britain at a tithe of their original cost.

Senator Depew pertinently asks, "Why this change of policy?" The same arguments then prevailed which are advanced today—that a few firms or corporations would be supported out of the treasury of the United States. Building and running ocean steamers is not within the capital or capacity of individuals; nor can it be done by many corporations. The number of ships necessary to carry on this commerce must be limited. The important point is this: Shall the government create conditions where American capital can live, can dot the ocean with American steamers, can put the American flag as it was once in every port of the world; can carry American products in American ships, and can make the captain and officers of every American vessel active agents for the promotion and sale of the products of American labor in the competitive ports of South America, Australasia, China and other eastern countries? Shall our communication with the islands we have acquired—Hawaii and the Philippines—be maintained under our own flag or subject to our friendly or hostile relations with other powers? Because the American farmer is protected in his wool against Australian and Soutn American competition and in the other products of his fields and of his labor we do not say that that legislation is for a people of a class. Because the iron worker, steel worker, coppersmith, silversmith, goldsmith and artificer in wool, cotton, wood and other fabrics are protected by tariff against pauper competition, we do not

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say that this legislation is for the benefit of capital and labor engaged in these industries. We say that such legislation is to enable Americans to be fed and clothed by Americans, to enable American labor to live under conditions different from and better than those which prevail in other countries. It is to make our country self-sustaining in every necessity and almost every luxury; it is to promote and encourage the skill of our artisans and the active employment of our capital that we may successfully compete with industrial rivals and other countries. Now having subsidized railroads to go over the mountains to connect the Pacific and Atlantic coasts, having spent hundreds of millions to improve rivers and waterways for our internal trade and harbors for our foreign commerce, we balk at the same policy that we may reach under equal conditions competitive markets outside of our own country.

Senator Depew pointed to the fact that the ocean mail bill contemplates no diversion of funds from the public treasury. The ocean mail service at present pays an annual profit of $3,600,000 and the cost of the extended service under the new bill would not exceed that sum.

PIG IRON SITUATION.

The awarding of contracts by the national government, as well as municipalities, and the buying of wire, tin plate and other products more or less directly affecting the farming community, continue to support largely the iron and steel market. The decision of the Chicago, Milwaukee & St. Paul railroad to begin building 2,500 stock cars and 70 locomotives at its Milwaukee shops is one of the encouraging signs of increased railroad activity. A surprising number of small orders in finished lines, especially structural material and malleable castings, has developed of late. The Steel Corporation shows slightly increased activity, and the large independent interests report orders for March amounting to 10 per cent more than for February. The Corporation is continuing the new construction ordered last year. The American Sheet & Tin Plate Co. expects to operate next week within 5 per cent of the capacity in operation one year ago, the demand from canners being especially heavy.

The pig iron market continues dull. Southern iron has been sold on a $12 Birmingham basis, but sales have also been made at a higher figure. The new price schedule is being generally adhered to in the central west. The coke market is weak. The fear of a strike of coal miners has had little effect upon it, and coke prices remain irregular.

GREAT LAKES TOWING.

At a meeting of the directors of the Great Lakes Towing Co. held this week Edward Smith was re-elected president and treasurer. Since Mr. Smith took hold of the affairs of this company it has been placed upon a sound basis, both physically and financially. He has consistently followed the policy of steadily improving its physical property even anticipating its needs in this particular with the result that the company is well equipped to promptly perform all the functions of its varied business. Naturally its earning power has been developed to the highest point.

Officers were re-elected as follows: Chairman of the board, General George A. Garretson; president and treasurer, Edward Smith; secretary, M. H. Wardwell; executive committee, General George A. Garretson, Robert R. Rhodes, H. G. Dalton, A. B. Wolvin, Capt. James Davidson, Capt. D. Sullivan, L. M. Bowers, C. E. Grover and Edward Smith.

PRESIDENT EDWARD SMITH OF THE GREAT LAKES TOWING CO.

The steamer Eugene Zimmerman has been held to be entirely at fault in the collision with the steamer Saxona in St. Mary's river in April, 1906. This conclusion has just been reached by a board consisting of W. B. Cady, of Detroit, and Harvey D. Goulder and Hermon A. Kelley, of Cleveland. It will be recalled that the Zimmerman was on her maiden trip with coal when the collision occurred. Her stem was crushed in practically to the screen bulkhead and her cargo hold filling with water she sank almost immediately. What with the work of salvage and repairs she was out of commission a fair part of the whole season, entailing severe losses. The Zimmerman is owned by L. S. Sullivan, of Toledo, and the Saxona by G. A. Tomlinson, of Duluth.

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The Passing of the Old Sea Captains of Our Once Renowned Fleet of Clipper Ships

By F. D. Herriman

Few indeed are left of the old ship masters of 50 years ago, and before the close of another decade it is possible that not one of those practical resourceful seamen will be left above the sod, to tell again and again with pardonable pride of the achievements and daring of the seamen of their day. Sailors they were in every sense of the word, for steamers in the merchant service were few indeed. Their Alma Mater was the vessels of our great coasting and West India fleets of the 30s and 40s of the last century. They graduated with the highest honors, when from the early 50s to the close of our civil war, they commanded our then great fleet of world-renowned clipper ships.

Using the sailor phrase complimentary to our able and trusted officers, "He came on board through the hawsepipes and worked his way aft to the quarter deck." And in the average seven years that completes the course from the apprentice to the master, they not only became proficient as navigators and skillful seamen, but in a greater or less degree acquired the cunning of the merchant or supercargo, often buying their cargoes or chartering their ships for important undertakings; dealing direct with the merchant or shipper, without the aid of the middle-man, and thus adding power and importance to the already absolute control of the situation. It was the rule, too, almost without exception, that the master should be financially interested in the vessel he commanded; owning, as the case might be, from one-sixteenth to a quarter of a vessel.

There can be no doubt in the minds of those familiar with the history of our merchant marine, that the seamen of the old school, from the days Elias Haskel Derby, Joseph Peabody, William Gray, Samuel Endicot H. Raynolds, and others, old merchant captains of Salem and Boston, dating from the middle of the seventeenth century (pioneers of our trade in the far east) to the men that commanded our fleet of overseas ships, at the close of our civil war, were the peers in the profession that have never since been equalled.

And in the decades of the 30s to the 60s, in the last century, in which we are now particularly interested, the comparatively few officers now living who sought and obtained employment in English tramp steamers, or in ocean liners, after our fleet of sailing ships had disappeared from the face of the waters, will tell you, that it is not possible under existing conditions to make seamen of the old stamp, of the deck hand of the modern built steamer. If we except the duties of the quartermaster, the landsman, the boat and fire drill, there is nothing to be learned in the art of seamanship as we understand the meaning of the word.

The full-rigged sailing ship is not only the most complete institution for the training of the apprentice in all branches of seamanship, but a moving, pitching, rolling gymnasium of the greatest perfection for the development of muscle and self reliance. The hand work, and daring displayed to an ordinary audience by the athlete in our gymnasiums on shore, where a net is stretched beneath the performer, to give assurance that should he fall he would receive no harm, is child's play compared with the nerve and feats of daring that are hourly displayed, day and night, on board a full-rigged sailing ship at sea.

Watch the 15-year-old royal boys, among whose duties are the loosing and furling of the royals and skysails, at the top of the tapering masts, 160 ft. or more above the heaving, surging ocean. At times with a strong beam sea, these little chaps, on their high perch, would be describing an arc in the air of 50° or 60°. Clinging like monkeys to the mast and rigging, when she gave an extra deep roll, and again working like little beavers, to gather up the sail when the ship for a moment became steady. The climax for nerve and daring came when they would work their way to the very end of a royal or skysail yard, to recover a lost gasket that was streaming from the end of the jackstay, far out to leeward. If, when in this position, the ship takes a deep roll, the little chap spreads his feet on the foot rope, contracts all his muscles, grasps the yard with both arms, closes his eyes, murmurs a little prayer, all in the space of a few seconds, and waits the return to normal conditions; when he works his way into the bunt and completes the furling of the sail. Often the lads would return to the deck after accomplishing their task with pallid faces, not from fear, but from seasickness that they were striving manfully to overcome. At such times, the lads would have the heartfelt sympathy of the humane captain or deck officer, for they, too, as boys, had fed the fishes from the royal yard. It is a well-known fact, however, that the quickest and surest way to overcome the malady is to keep moving in the watch on deck and, if possible, divert the mind by some interesting work.

To the reader who can recall the busy scenes in our New England ship yards, immediately following the rush for the gold fields of California, or who is familiar with the history of our merchant marine following the discovery of gold on our Pacific coast, will note that the most famous of our ships for speed and fast passages were built in the years 1849 to '55. They were built exclusively for the California trade, and everything in their construction, excepting the necessary strength, was sacrificed for speed.

Our shrewd and enterprising merchants of the east saw the golden harvest that awaited the arrival of the much-needed necessaries of life among the thousands that had flocked from all parts of the world to the gold fields, and no expense was spared to rush the building of these vessels that they might with the least possible delay proceed to their loading berths and receive the general merchandise that congested warehouse and wharf.

Under ordinary circumstances, the extremes resorted to in the construction of these vessels would have made them financial failures when compared with ships that preceded as well as followed this extreme type of vessel. Their dead weight capacity was but a trifle more than their gross tons measurement. So fine were their lines, and so taut and massive were their spars, rigging and general equipment; carrying an excess of spare spars, sails and cordage, that so increased their displacement, that they

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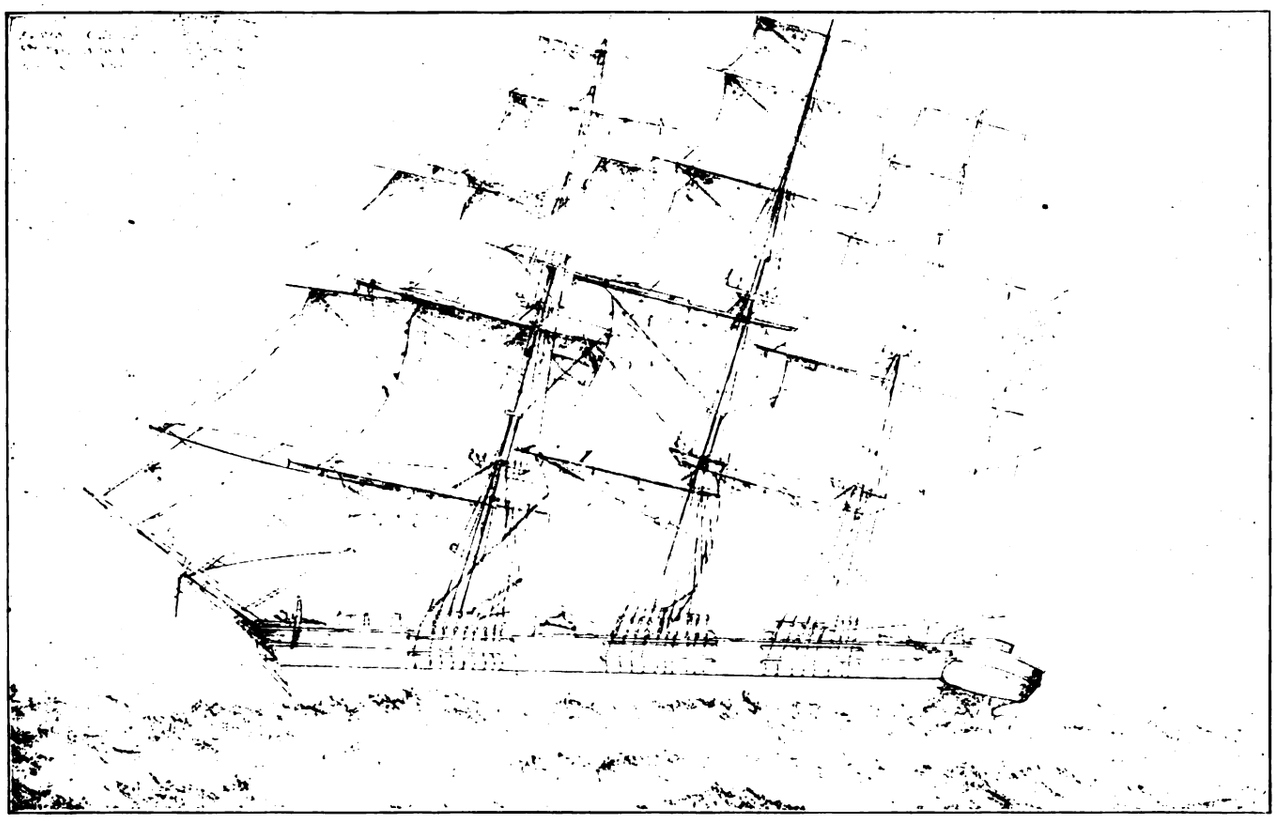
lost in their deadweight carrying capacity from 50 to 150 tons, when compared with the type of vessel that followed their advent. But, notwithstanding this loss in their carrying capacity, the demand for cargo space in those vessels was so urgent, and such fabulous rates of freight were asked and paid, that some of these ships, if the report be true, paid back to their shareholders or owners, their entire cost and outfit on the winding up of their second round voyage between New York and San Francisco.



THE FULL-RIGGED SHIP FLYING CLOUD.

From a drawing by Capt. F. D. Herriman.

The decade following the construction of the extreme clipper produced a much larger fleet of more burdensome vessels, and though their coefficient of fineness was much less than the extreme clipper, they made some exceptional records for speed, and carry from 20 to 30 per cent more cargo.

Returning to the advent of the extreme clipper ship of some 60 years ago: A panorama of those stirring times is now passing before the mental vision of the writer.

Stowed away in some spare locker of the gray matter are vivid impressions of the sailor boy of 16. Alive to the importance of a thorough knowledge of the work and duties of an able seaman, before he could reach the exalted position of chief officer and captain, I, with other contemporary companions watched with keen interest the sparring and rigging of those vessels that were building in the various ship yards in and near our homes on the Penobscot river. And when the coasting vessels in which we were employed were laid up in the fall, we found no trouble in securing a job to help rig one of the big ships; and so, armed with a broad leather belt, to which was attached a leather sheath, for the marling spike, sheath knife, and slush horn, we soon became proficient, not only in laying on the tarred parceling and passing the ball, but acquired the more important art and duties of using the serving mallet, turning in a dead eye, making a lanyard knot, squaring or rattling down the standing shrouds, rigging shears to hoist on board and step the heavy lower masts 85 ft. long by 34 in. in the partners, etc.

I remember how forcibly I was impressed by the new and novel design of these vessels, so different were their lines and general construction from the type of ship that preceded them. Their great rise of floor bringing their bilges high above the garboards; their long thin deadwood, both forward and aft, so solid and compact that a cat could not get within 40 ft. of the inner face of stem and stern post. So gradual and extreme were the harping of their frames, from midlength to the ends, that it was difficult to find a superficial straight foot of planking on their round and polished sides. The omission of flare, to their top-timbers forward, their deep bulwarks, paneled monkey rail, and elliptic stern, were features new and startling. In my early voyages I saw these ships frequently at sea, under full sail, at anchor in Boston and New York harbors; I saw them frequently, at their loading berths in New York—their bowsprits and jibbooms extending far over South street, their high bows and overhanging cutwaters richly ornamented by massive gilt scroll, or carved figure, suggestive of their startling but pleasing names, such as "Flying Cloud," "Flying Fish," "Flying Scud," "Wild Pigeon," "Trade Winds," "John Gilpin," "Grace Darling," "Great Republic," "Dreadnaught," "David Crockett," "Redjack-

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et," and others built about the same time.

It is of the captains and officers of this fleet of noted ships that I would give the full meed of praise. They live in the memory of the few of their day that still float at their moorings here below.

Lieut. F. Maury, then of the United States navy, in his physical geography of the sea, writes of these men as follows:

"That this magnificent fleet of American clipper ships were skilfully navigated, ably handled, and bravely sailed, we have ample proof." Their commanders and officers were pioneers in a system of philanthropical research that has unquestionably been the means of shortening the voyages from port to port by many days.

Before the advent of these fast ships, vessels leaving our North Atlantic ports for destinations south of the equator, would work far to the eastward in the variable winds north of the northeast trade winds, in order to fall in with the Cape Verde islands, and follow the beaten track of the Dutch and Portuguese of the sixteenth century. From here they would endeavor to cross the equator as far east as the 20 or 25 degrees of west longitude, and were thus forced to work their way through a wide belt of calms and doldrums that are known to exist in that locality. The belt of calms and baffling winds taking the form of a wedge, extending from Cape St. Roque, the northeast point of Brazil, to the coast of Africa, the point of the wedge terminating at Cape St. Roque. Thus, the farther east one crossed the equator, the more calms and doldrums he encountered. But the object in making the crossing so far to the eastward was to enable them after taking the southeast trade winds on the port tack, and so pass south of Cape St. Roque and Point Olinda as well without tacking. (For it was said that no ship could make headway against the sweeping current to the north should they fall to leeward of this much dreaded cape.) Hence the detour and loss of time by our earlier navigators.

The old story of shipwreck and suffering by the more ancient and less courageous navigators who had fallen to leeward and after repeated efforts to beat round Cape St. Roque, gave up in despair, and bore away for the variables and the gulf stream to assist them to again get in a position to weather St. Roque; had a most depressing effect on the old time navigator with his short, full-bowed vessel, that would scarce brace within seven points of the wind.

But the dawn of a new era in our merchant marine, which the evolution of time and circumstances had forced to the front, caused an awakening of the maritime world to the need of a more intelligent understanding of the ocean highways between the nations of the earth, came with the building of our first fleet of clipper ships.

The able and courageous men that sailed them, with minds and heart not only free from the old time superstitions and dread, but buoyant with courage and daring, were the instruments that the great admiral had seen fit to provide to clear the seas of imaginary dangers, to blaze new paths through hitherto unfrequented seas, and thus shorten the distance from port to port the world over.

Through the instrumentality of that very able seaman, Lieut. F. Maury, a system of research was introduced and established, and a special form of abstract log, as it was called, was provided and forwarded by the superintendent of the national observatory at Washington, to the masters and officers who cared to enter the field of inquiry; and the navigator was requested to note in this abstract log, from three to as many times as his interest in the work would permit, during each 24 hours, the position his vessel, giving the latitude and longitude by observation when possible; the reading of the barometer, air and water thermometers, the direction from which the wind came, and its force calculated by the sail the vessel would carry when close haul, the rate and set of the current by the difference between dead reckoning and observation; also the duration of calms. They were also requested to gather flotsam, sedges, seaweeds, leaves, and any floating matter they could secure by means of grapple and dip-net; noting the latitude and longitude the vessel was in when the floating matter was secured. This collection of data was, on arrival at port of destination, forwarded to Lieut. Maury at Washington, and by him was compared with hundreds of similar abstract logs, and thus forming the nucleus of the celebrated wind and current charts, and a new era to the navigator.

By this system of inquiry calms, adverse currents and circuitous routes were avoided, and the average passage from New York to San Francisco was "reduced from 183 to 135 days, and from England to Australia from 122 to 97 days," and so throughout the seas frequented by these ships a notable saving in time was made. "The spirit of friendly emulation among the officers of these ships, in the cause of science and progress in their profession, was crowned with success." In referring to the wind and current charts and the support and confidence they afforded the master, Lieut. Maury says: "The quick, practical mind of the American ship-master took hold of the proposition at once. To him the field was inviting, for he saw in it the promise of a rich harvest." And in referring to the great ocean race from New York to San Francisco in the fall of 1852, between the clipper ships, "Wild Pigeon," Captain Putnam, "John Gilpin," Captain Done, "Flying-fish," Captain Nichols, and the "Trade Winds," Captain Webber, he writes: "Like steeds that knew their drivers, they were handled with the utmost skill and judgment, each put upon his mettle from the start, was driven under a seaman's whip and spur, at full speed, over a course that would take three long months to run."

"The race was won by the 'Flying-fish' and their respective passages were 118, 93, 92, and 102 days." From the knowledge thus obtained by close and careful investigation of the causes that have retarded the voyages of the earlier navigator, they were able to avoid the mudholes, and difficulties that beset them. The importance of these investigations then in their full flood, attracted the attention of the commercial world, and the United States invited the maritime nations to a conference with the view of united action in the work. And on Aug. 23, 1853, a conference was held at Brussels, where the following nations were represented: England, France, Russia, Denmark, Norway, Sweden, Holland, Portugal and the United States. At this conference a uniform system of observation at sea was adopted. Prussia, Spain, Australia and the maritime divisions of South America soon after offered their co-operation in the great work, and it was agreed that in peace, and in war, these observations should be carried on. And in case any of the vessels on board which they were conducted were captured, the abstract log or journal of observation was to be held sacred."

And so we claim, without fear of contradiction, that the unity of action among the American captains and officers of our fleet of fast ships, built between the years of 1849 and 1855, by which the nations of the earth have received incalculable benefits, was brought about by the intelligent

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skill and daring of American seamen.

"Oh! 'tis a thought sublime, that man
can force
A path upon the waste, can find a way
Where all is trackless, and compel the
winds,
Those freest agents of Almighty pow-
ers,
To tend them untamed wings and
bear him on
To distant climes." (Ware)

But in God's own mysterious ways, the beginning of the end of our then maritime greatness, and the death knell of our once renowned fleet that shadowed every sea in the civilized world, came with the close of our civil war, and with them the doom of the old time square rig sailors. Their jig was up. Never again would he get a pull at the new hemp backstays that were getting their set, at the hounds of the tall wood top-mast, and the tar bucket, marling-spike and slush horn must go for good. The smoky, greasy, smelling tramp steamer had come to stay. The cloud of depression long since seen on the horizon of the freight markets of the world, now cast their deep shadows about the doomed fleet of wooden ships, and so great was the decline in their values that a stampede to get rid of them at any price, set in, and many were sold for one-half and less than their ledger value of the preceding year. Notwithstanding a temporary revival in the freight market, the wooden square rigger was on the run for the bone yard, never to be replaced by their kind. They gradually disappeared from the face of the waters. Those that were not lost at sea we saw grow old and infirm, like the men that had sailed them in their palmy days. We saw their once graceful lines twisted and distorted with humps and displacements. The tall and tapering spars reduced to stub top-gallant masts, and the once immaculate holy-stoned decks thickly coated with coal tar.

It is possible that not even the battered hulk of one of these wonders of their day are to be found afloat at the present time. Some were destroyed by fire, others are resting in the coral graves of tropical seas, with many fathoms of clear blue water above them. Others lay in the bone yard of both foreign and home ports, or perchance the ever-restless tides of some stretch of bleak and lonely coast, or sandy bar, may be singing the storm fiend, or murmuring a soft lullaby through their worm-eaten and slimy timbers! Who knows?

ATLANTIC COAST GOSSIP.

Office of the MARINE REVIEW,
Room 1005, No. 90 West St.,
New York City.

The Cunard liner Lusitania, on her arrival at New York last Friday, reported two record days' steaming. For the day ended at noon Tuesday she logged 627 knots, and for the day ended at noon Friday 625 knots. The best previous daily westward run was 624 knots made by the Mauretania, the Lusitania's best day's run being 618 knots.

The Mauretania also made a record on her last eastbound voyage, covering 2,932 miles—the long course—in 5 days 5 minutes. Her average speed was 24.42 knots against the former record, also made by the Mauretania, of 23.90 knots. On her best day's run she averaged 24.77 knots.

Record making and breaking is quite a little family affair on the Atlantic these days.

Owing to a slight fire which broke out among the freight aboard the Fall river liner Providence, Fall River for New York, the passengers were transferred to the Richard Peck, of the same line, and landed at their destination. Owing to the prompt measures taken by crew to suppress the blaze little damage was done. The awakening and transference of the passengers was handled with but little excitement, also.

The work of unloading the cargo of the British steamer Silvia, which ran onto Sow and Pigs reef on Saturday, is being carried out by wrecking outfit from New York, reinforced by a tug and lighter. The salving is attended with considerable difficulty, owing to the heavy sea running, and it is expected that a considerable portion of the cargo will be a total loss. Owing to the gale of Sunday the Silvia has settled nearly to the upper deck, and the chances of saving her are considered poor.

The scout cruiser Birmingham arrived in Boston harbor on Sunday, having completed her trials and exceeded all government requirements in her official tests. In the four hours' endurance run the Birmingham developed an average speed of 24.32 knots. In her 24-hour 22.5-knot test she maintained a speed of 22.665 knots on an average coal consumption of one ton for every 2.475 knots.

The schooner Leah Whiddon, of Barbados, was sighted by the British steamer Matador on Feb. 18, proceeding to Barbados under jury rig. She was several hundred miles east of Florida, and had been out 38 days from Bahia. The Matador supplied provisions to the crew of the Whiddon and reports that when spoken repairs were being made aboard the schooner, the captain's wife being at the wheel.

The Pennsylvania naval reserves have secured from the government the steam yacht Silvia, which will be used for training purposes. She will be fitted out at Philadelphia.

The registered mail supposed to have been lost between Liverpool and New York in January has turned up at Yokohama. It was shipped there in error, and is now on its way to this city.

The City of Everett of the Standard Oil Co., left the Delaware last week for London. She has a barge in tow, both having cargoes of oil, and will return under ballast. The captain, A. F. Lucas, recently took a cargo of oil to Hamburg, also with a barge in tow, and is now on the way back. Many of the steamers formerly in the coastwise oil trade have been withdrawn by the Standard Oil Co. for the trans-Atlantic service. This is taken by many to indicate a falling off in the coasting trade, whereas the new method of transporting oil across the Atlantic is proving both profitable and economical.

The new steamship Nann Smith, which left Baltimore on Jan. 6, has arrived at San Francisco, having made the run in about 66 days. She is owned by the Smith Lumber Co. of Minneapolis, and is commanded by Capt. H. C. Nelson. She made the run without being reported.

The Mauretania, sighted at night, according to one trans-Atlantic passenger, has the appearance of a skyscraper gone adrift.

The Brunswick Steamship Co. announces a new semi-weekly service between New York and Brunswick, Ga., to be inaugurated April 1. Five newly-constructed 3,000-ton steel steamers will fill the service, sailings to be on Wednesdays and Saturdays from both ports.

The Brunswick Steamship Co. has hitherto maintained irregular sailings between New York and Brunswick, but has now decided to supplant this with the new service.

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FOR THE LAKE MARINE

In this department hereafter will be found everything of current interest pertaining to Lake Navigation. Masters are advised to consult it weekly for information of interest to them; and owners are invited to use it freely for the promulgation of all announcements of a general nature. The Marine Review will be placed aboard every vessel having membership in the Lake Carriers' Association, representing a registered tonnage of nearly 2,000,000 tons, and can, therefore, be depended upon as a reliable courier to the entire fleet. It will reach every vessel in active service weekly. It is the intention to make this department complete so that at the end of the year it will be an authentic record which should prove of permanent and increasing value to owners and masters alike.

At the annual meeting of the Pittsburgh Steamship Co.'s masters and officers, held at the Hollenden in January last, Capt. C. H. Westcott, supervising inspector, delivered an address with special references to the rules that are not usually complied with by vessel officers. He said:

ADDRESS OF CAPT. C. H. WESTCOTT.

"Mr. President and Gentlemen of the Convention: As has already been stated, I am here by invitation of the president, at whose request I have prepared a paper covering some of the laws and rules that, from experience, I have found in many cases are not understood or complied with by licensed officers; due to the fact, I presume, that while, as a rule, the older masters are familiar with the law, many of the younger ones with less experience are not, or do not seem to realize the vital importance of their strict observance. I will undertake to explain in as plain a manner as possible, those of the laws and rules that, from investigation, I have found to be less understood or more generally violated by licensed officers.

Rule 1, Page 3, Pilot Rules, which reads as follows:

In all weathers, every steam vessel under way in taking any course authorized or required by these rules shall indicate that course by following signals on her whistle, to be accompanied whenever required, by corresponding alteration of her helm; and every steam vessel receiving a signal from another shall promptly respond with the same signal or sound the danger signal as provided in Rule 2.

One blast means—I am directing my course to starboard—except when steamers are approaching each other at right angles or obliquely, other than when one steamer is overtaking another, one short blast signifies intention of steamer which is to starboard of the other to hold course and speed.

Two blasts mean—I am directing my course to port—except that when two steamers are approaching each other at right angles or obliquely, other than when one steamer is overtaking another, two short blasts signify desire of or assent to steamer which is to port of the other to cross the bow of the steamer to starboard,

has, in many cases, been misinterpreted or misunderstood. To illustrate: I will take the case of a steamer with a tow coming down the river at Detroit with a single steamer following. The steamer ahead, wanting to round to at Detroit, gave a signal of one blast of the whistle, as the master understood the rule, to indicate that he was directing his course to the starboard, while the steamer astern understood from the signal that the steamer ahead wanted him to pass to starboard, it being a passing signal as he understood it, with the result that the single steamer brings up in the bight of the tow. Other similar cases have been reported, all of which are due, as I believe, to the lack of care in reading or becoming familiar with the rule. This rule, which reads in part, "In taking any course authorized or required by these rules," means just what it says; is very plain; and is not susceptible of misinterpretation; the mistake being, in the cases just referred to, that the steamer ahead was not authorized by the rules to signal her intention or desire to the steamer astern, as there is nothing in the rules authorizing or making it the duty of the steamer ahead to indicate her intention or desire to the steamer astern. On the contrary, it is the duty of the steamer astern to signal the steamer ahead, as provided for in Rule VIII, Page 5, and under no circumstances should the steamer astern attempt to pass until the signals have been agreed upon; and in all cases these signals should be given at a sufficient distance astern by the steamer desiring to pass in order that the steamer ahead may know the desire of the steamer astern in time to give her consent or blow the danger signal before the vessels are abreast or in close proximity with each other.

Rules II, III and IV, Pages 3 and 4.

Rule II. "If, when steamers are approaching each other, the pilot of either vessel fails to understand the course or intention of the other, whether from signals being given or answered erroneously or from other causes, the pilot so in doubt shall immediately signify the same by giving the DANGER SIGNAL of four or more short and rapid blasts of the whistle; and if both vessels shall have approached within half a mile of each other, both shall be immediately slowed to a speed barely sufficient for steerageway, and, if necessary, stopped and reversed until the proper signals are given, answered and understood, or until the vessels shall have passed each other."

Rule III. "Steam vessels are forbidden to use what has become technically known among pilots as CROSS SIGNALS—that is, answering one whistle with two and answering two whistles with one. In all cases, and under all circumstances, a pilot receiving either of the whistle signals provided in the rules, which for any reason he deems injudicious to comply with, instead of answering with a cross signal, shall at once sound the danger signal and observe the rule applying thereto (Rule II)."

Rule IV. "The SIGNALS FOR PASSING, by the blowing of the whistle, shall be given and answered by pilots in compliance with these rules not only when meeting 'head and head,' nearly so, but at all times when passing or meeting at a distance within half a mile of each other, and whether passing to the starboard or port."

"These rules refer to the blowing of passing signals and prohibit the use of cross signals. Passing signals should be blown at all times when meeting or passing within a half mile of each other. This rule should always be observed; but, in many cases in the past, I fear it has been violated. Such violations for your own good as well as for the good of the other fellow, must be discontinued in the future.

"In rivers, as provided for in Rule 5, Page 4, the down-bound steamer has the right of way, and shall, before the vessels shall have arrived within a distance of ½ mile of each other, give the signal necessary to indicate the side she elects to take. This is important and should always be strictly observed. Do not wait until the steamers are so close together that the up-bound steamer deems it necessary to give a passing signal, as the rule provides that the down-bound steamer shall give the necessary signal.

CROSS SIGNALS.

"Signals technically known as *cross signals* should never be blown. In cases of misunderstanding, or where you cannot agree with the other steamer, you should at once blow the danger signal and reduce the speed of your steamer so that you have her under perfect control.

Rule VIII, Page 5.

"WHEN ONE STEAMER IS OVERTAKING ANOTHER, and the pilot of the steamer which is astern shall desire to pass on the right or starboard hand of the steamer ahead, he shall give one short blast of the whistle, as a signal of such desire or intention, and shall put his helm to port; or if he shall desire to pass on the left or port side of the steamer ahead, he shall give two short blasts of the whistle as a signal of such desire and intention, and shall put his helm to starboard, and the pilot of the steamer

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ahead shall answer by the same signal; or if he does not think it safe for the steamer astern to attempt to pass at that point, he shall immediately signify the same by giving four or more short and rapid blasts of the whistle, and under no circumstances shall the steamer astern attempt to pass the steamer ahead until such time as they have reached a point where it can be safely done when the said steamer ahead shall signify her willingness by blowing the proper signals. The boat ahead shall in no case attempt to cross the bow or crowd upon the course of the passing steamer.

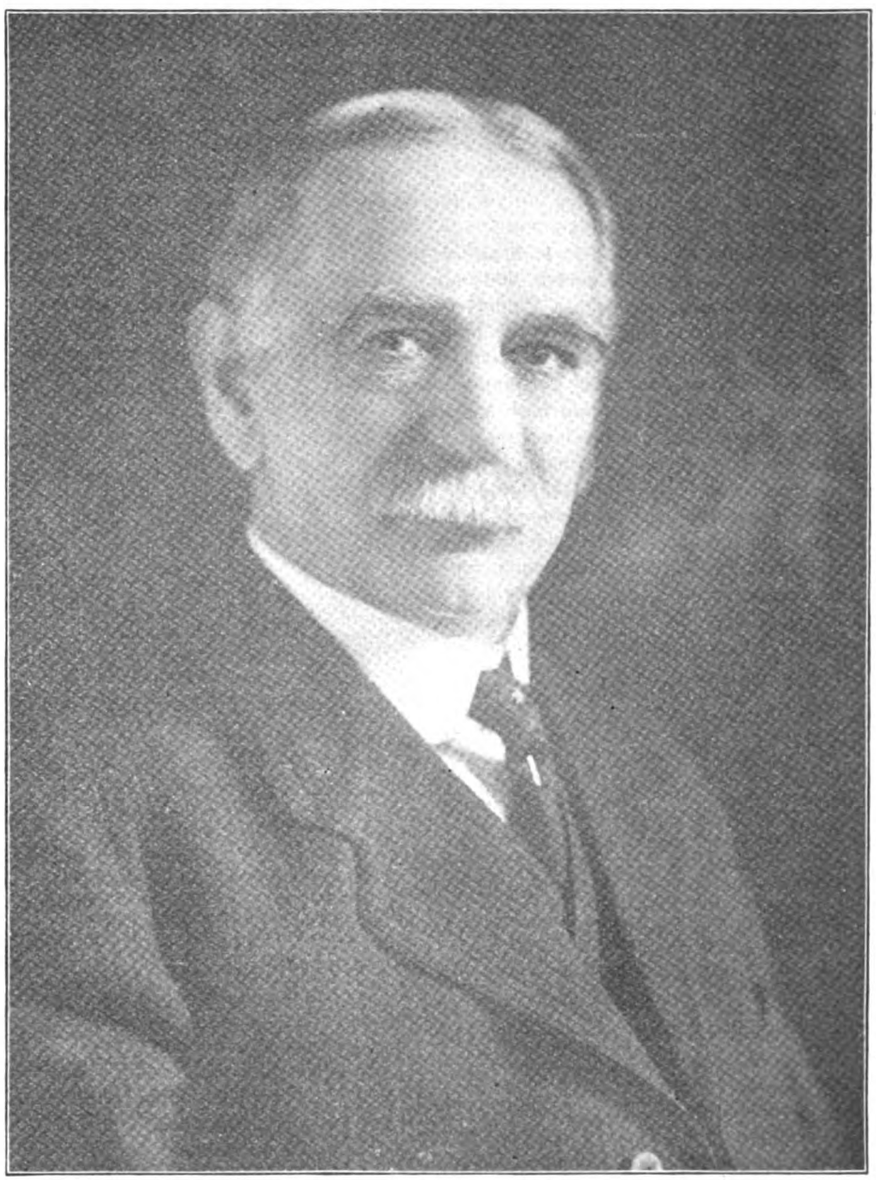
"Every vessel coming up with another vessel from any direction more than two points abaft her abeam—that is, in such a position with reference to the vessel which she is overtaking, that at night she would be unable to see either of that vessel's side lights—shall be deemed to be *an overtaking vessel;* and no subsequent alteration of the bearing between the two vessels shall make the overtaking vessel a crossing vessel within the meaning of these rules, or relieve her of the duty of keeping clear of the overtaken vessel until she is finally passed and clear.

"As by day, the overtaking vessel cannot always know with certainty whether she is forward of or abaft this direction from the other vessel, she should, if in doubt, assume that she is an overtaking vessel and keep out of the way."

"This rule provides for an overtaking steamer passing another, and makes it compulsory upon the overtaking steamer to notify the steamer ahead, by giving the proper signal on which side she desires to pass, and under no circumstances should the steamer astern attempt to pass another vessel without giving such signal and receiving consent from the steamer ahead by a similar signal. If the steamer ahead deems it unsafe to allow the other steamer to pass at that point, she should blow the danger signal, and no attempt should be made to pass until a thorough understanding and agreement has been reached; and then, if in a narrow channel or in close proximity with each other, I would advise that the steamer ahead be checked and let the other pass as soon as possible consistent with safe navigation and thereby avoid any possibility of an accident by going at too great a speed.

Note: You must bear in mind, however, that at no time is the overtaking vessel relieved from the duty of keeping clear of the overtaken vessel. At the same time, the vessel ahead should do everything in her power to facilitate the passing of the overtaking vessel, even to the extent of checking if necessary. The practice followed by many masters of blowing a checking whistle to the other steamer is not authorized by the rules and should be discontinued. There is no rule that authorizes the master of one steamer to direct or advise the master of another steamer how to navigate his steamer. If, in your opinion, a steamer meeting or passing you is being navigated in a manner that will endanger your steamer, you should blow the danger signal and not a check whistle to the other steamer, but, on the contrary, check your own steamer, if necessary, using your check whistle in order that the master of the other steamer may know that your vessel has been checked. Each master should navigate his own vessel and be responsible for its safe navigation. As stated, *do not blow for the other fellow to check,* but check your own vessel, and blow the danger signal to the other fellow to advise him that, as you see it, the situation is dangerous, and let him be responsible for the navigation of his own vessel.

"In connection with this subject, I might say, with regard to the practice of blowing four whistles to another steamer to come ahead strong, that such practice is not authorized by the rules and should be discontinued.



CAPT. J. W. WESTCOTT.

Rule XIV, Page 6.

FOG SIGNALS.

"Whenever there is thick weather by reason of fog, mist, falling snow, heavy rain storms, or other causes, whether by day or by night, fog signals shall be used as follows:

"A steam vessel *under way,* excepting only a steam vessel with raft in tow, shall sound at intervals of not

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more than one minute three distinct blasts of her whistle.

"*A steamer with a raft in tow* shall sound at intervals of not more than one minute a screeching or Modoc whistle for from three to five seconds.

"Every vessel *in tow of another vessel* shall, at intervals of one minute, sound four bells on a good and efficient properly placed bell as follows: By striking the bell twice in quick succession, followed by a little longer interval, and then again striking twice in quick succession (in the manner in which four bells is struck in indicating time).

"Any vessel *at anchor* and any vessel aground in or near a channel or fairway shall, at intervals of not more than two minutes, ring the bell rapidly for three to five seconds."

"This rule, which read in part as follows: 'Any vessel at anchor and any vessel aground in or near a channel or fairway shall, at intervals of not more than two minutes ring the bell rapidly for three or five seconds,' I have quite recently been creditably informed, has in many cases been neglected or violated, that is to say, instead of ringing the bell as required by law, Rule 14, Article E, Page 17, as well as the rule above quoted, some masters have, it is said, followed the practice of blowing the steam whistle, a practice wholly unauthorized by law.

Rule XV, Page 7.

SPEED TO BE MODERATE IN FOG, AND SO FORTH.

"Every steam vessel shall, in thick weather, by reason of fog, mist, falling snow, heavy rain storms, or other causes, go at *moderate* speed. A steam vessel hearing, apparently not more than four points from right ahead the fog signal of another vessel shall at once reduce her speed to bare steerageway, and navigate with caution until the vessels shall have passed each other,"

provides that 'a steam vessel hearing, apparently, not more than four points from right ahead the fog signal of another vessel shall at once reduce her speed to bare steerageway, and navigate with caution until the vessels shall have passed each other.' Bare steerageway, as I interpret the rule, means a speed at which you have your steamer under perfect control. With both steamers being navigated in this manner, a collision with serious results would be an utter impossibility.

"In connection with this subject, permit me to say that I cannot now call to mind a single case of a collision in a fog between two steamers with tows. There have been a limited number between single steamers and tows and, I regret to say, many more between single steamers, from which I am forced to the conclusion that collisions in a fog are caused, almost without exception, by one or both vessels being navigated at a too high rate of speed at the critical moment.

"Rule prohibiting unnecessary sounding of the steam whistle, Page 13.

"The board of supervising inspectors, at their annual meeting of January, 1907, adopted the following rule:

"Unnecessary sounding of the steam whistle is prohibited within any harbor limits of the United States. Whenever any licensed officer in charge of any steamer authorizes or permits such unnecessary whistling upon conviction thereof before any board of inspectors having jurisdiction such officer shall be suspended from acting under his license as the inspectors trying the case may deem proper."

This rule was authorized by act of congress, approved Feb. 8, 1907, has the force of law and should be observed.

Section 2, Rule 28, Page 18 of the laws regulating the navigation of vessels on the great lakes, which reads as follows:

"That a fine, not exceeding $200 may be imposed for the violation of any of the provisions of this act. The vessel shall be liable for the said penalty and may be seized and proceeded against by way of libel in the district court of the United States for any district within which such vessel may be found,"

provides for a fine not exceeding $200 for violation of any of the provisions of this act. Therefore, you will understand that for violation of any of the provisions of this act in addition to subjecting yourself to the penalties prescribed, the vessel is also liable for the said penalty and may be proceeded against as herein provided.

Section 23, Rule V, Page 96, General Rules and Regulations.

"Whenever a steamer meets with an accident involving loss of life or damage to property, it shall be the duty of the licensed officers of any such steamer to report the same in writing, and in person without delay to the nearest board; *provided*, that when from distance it may be inconvenient to report in person, it may be done in writing only and the report sworn to before any person authorized to administer oaths,"

makes it the duty of licensed officers to report all accidents to the inspectors. This is for the purpose of giving the inspectors an opportunity to investigate and ascertain whether any of the laws have been violated or neglected in connection with the accident, and for further purpose of obtaining statistics.

Section 5, Rule VI, Page 107, General Rules and Regulations which reads:

"Whenever any vessel is placed upon the dock for repairs it shall be the duty of the master, owner, or agent to report the same to the Board of Local Inspectors of that district, so that a thorough inspection may be made by them to determine what is necessary to make such vessel seaworthy if the condition or age of the vessel, in the judgment of the inspectors, render such examination necessary."

makes it the duty of the master to also report to the inspectors whenever his vessel is placed on the dry dock for repairs, in order that the inspectors may, if necessary, make an inspection to determine what is necessary to make the vessel seaworthy.

These two last sections are the most neglected or misunderstood by masters and licensed officers of any of the rules, and should be more carefully observed. In some cases licenses have been suspended for the persistent neglect or refusal of the holder to comply with these rules.

"On page 49, of the Laws Governing the Steamboat Inspection Service, you will find the following proclamation by the President of the United States, Act of Congress, approved Sept. 4, 1890:

"BY THE PRESIDENT OF THE UNITED STATES OF AMERICA.
A PROCLAMATION.

Whereas an Act of Crongress in regard to collisions at sea was approved Sept. 4, 1890, the said Act being in the following words:

Be it enacted by the Senate and the House of Representatives of the United States of America, in Congress assembled, that in every case of collision between two vessels it shall be the duty of the Master or person in charge of each vessel, insofar as he can do so without serious danger to his own vessel, crew, and passengers, (if any), to stay by the other vessel until he has ascertained that she has no need of further assistance and to render to the other vessel, her master, crew, and passengers (if any), such assistance as may be practicable and as may be necessary in order to save them from any danger caused by the collision, and also to give to the master or person in charge of the other vessel the name of his own vessel and port of registry or the port or place to which she belongs, and also the names of the ports and places from which and to which she is bound. If he fails to do so, and no reasonable cause for such failure is shown, the collision shall in the absence of proof to the contrary, be deemed to have been caused by his wrongful act, neglect, or default.

SECTION 2. That every master or person in charge of a United States vessel who fails without reasonable cause to render such assistance or give such information as aforesaid, shall be deemed guilty of a misdemeanor and shall be liable to a penalty of $1,000.00 or imprisonment for a term not exceeding two years; and for the above sum, the vessel shall be held liable and may be seized and proceeded against by process in any district court of the United States by any person; one-half of such sum to be payable to the informer and the other half to the United States.

SECTION 3. That this act shall take effect at a time to be fixed by the

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President by the proclamation issued for that purpose.

And whereas it is provided by Section 3 of the said Act that it shall take effect at a time to be fixed by the President by proclamation issued for that purpose.

Now, therefore, I, Benjamin Harrison, President of the United States of America, do hereby, in virtue of the authority vested in me by Section 3 of the said Act, proclaim the fifteenth day of December, 1890, as the day on which the said Act shall take effect.

In testimony whereof I have hereunto set my hand and caused the seal of the United States of America to be affixed.

Done at the City of Washington, this eighteenth day of November, in the year of our Lord, one thousand eight hundred and ninety and of the Independence of the United States the one hundred and fifteenth.

(Seal.) BENJ. HARRISON.

By the President:

James G. Blaine, Secretary of State."

defining the duties of a master or person in charge of a vessel in case of a collision. This law, I fear, has not been understood by some of the licensed officers, hence the calling of your attention to it at this time, and the necessity of its strict observance.

"Another matter of vital importance to which I desire to call your attention is the blowing of passing or meeting signals, and then assuming what the other fellow is going to do, and navigating your steamer on that presumption until you find that he did not do as you expected, when it is too late to take the proper precaution. Violations of this nature have come to my attention during the past season, some of which are at present under investigation. It would be better to first have a clear and distinct understanding, and then navigate your vessel strictly in accordance with the signals given and not assume that the other understood what he was about, and was going to get out of your way.

"In conclusion, I would state that each master is furnished with a copy of the Laws and Pilot Rules, and if there are any who are not familiar with them, I would advise that you make it a point to study them carefully; and if you find any rule that you do not understand, or have any doubt as to its proper meaning, confer with the inspectors, who will, I am sure, be pleased to advise you in the matter. What the loss would be to the owners in case of a collision under circumstances such as I have described, that is to say, by failure to observe the rules, I am not prepared to say; but must assure you that where such cases are reported or come to the knowledge of the inspectors, investigation will follow, and if it is found that the violation charged is proven the penalties prescribed by law will surely follow as Section 4450, Revised Statutes, which read as follows:

> The local boards of inspectors shall investigate all acts of incompetency or misconduct, committed by any licensed officer while acting under the authority of his license and shall have the power to summon before them any witnesses within their respective districts, and compel their attendance by a similar process as in the United States Circuit or District Court; and they may administer all necessary oaths to any witnesses thus summoned before them; and after reasonable notice in writing, given to the alleged delinquent of the time and place of such investigation, such witnesses shall be examined under oath, touching the performance of his duties by any such licensed officer; and if the board shall be satisfied that such licensed officer is incompetent, or has been guilty of misbehavior, negligence, or unskillfulness, or has endangered life, or willfully violated any provision of this title, they shall immediately suspend or revoke his license,

makes it the duty of the local inspectors to investigate all such cases as come to their knowledge; and the inspectors occupy a relative position to yourselves, only that the penalties applying to them are much more severe than than those applied to you. If you fail to perform your duties in the matter of observing the laws and lose your license, it is, after a time, given back to you, while if the inspectors fail to perform their sworn duty and are dismissed, they will never be re-instated.

"In many cases, with yourselves as with the inspectors, your services are your capital and stock in trade, and in the event of your losing your position through an accident caused by carelessness or a violation of the laws, your capital becomes much impaired as under such circumstances it becomes, in many cases, very difficult to obtain another position, and I trust that in cases, if there be any, where you are not already thoroughly familiar with the rules, you will obtain a copy and study them carefully, and then observe them to the letter for your own interest as for the interest of all concerned. By so doing, you will make less trouble for yourselves, fewer investigations for the inspectors, more money for the owners and incidentally I might say less work for the lawyers.

"It was for the purpose of furthering your interests as well as those of the owners and the steamboat inspection service, and to reduce to the lowest possible number, disasters and violations arising from lack of knowledge of the rules that I consented to address you. I have endeavored to present these matters in as plain and concise a manner as possible, at the same time avoiding anything that might be considered personal, and I trust that you will accept the suggestions that I have made in the same spirit in which they are given." (Applause.)

DISCUSSION ON CAPT. WESTCOTT'S PAPER.

Capt. Secord—Capt. Westcott, for instance, if I were lying at an anchor off Detour and ringing my bell, and I heard some fellow approaching, would I be justified in using my whistle, if I didn't think he could hear my bell?

Capt. Westcott—I should say you would be justified in doing anything in that case to keep from being run over, but if you are going to make a practice of using your whistle, I would suggest you get the rule changed.

Capt. McGregor—Would that rule about unnecessary whistling apply to boats coming down the rivers, etc., for instance, blowing to anybody on the bank?

Capt. Westcott—I hardly think it would apply along the rivers generally, but I couldn't give you a rule on that, and would not want to tell you anything that might get you into trouble.

There was a steamer in Chicago this summer that played her calliope an hour each morning and complaint was made to the local inspector in Chicago and to myself. I took the matter up and it was decided that a calliope was a steam whistle, and came within the meaning of the law. The inspectors were instructed, not what to do exactly, but to prevent the nuisance, and they suspended the captain's license. Letters were written to Washington, etc., and the department decided that the calliope was not a steam whistle, so the captain's license was returned to him. Of course, there is no question but that this was within "The Harbor Limits."

Capt. Sullivan—Would you consider, Capt. Westcott, that a steamer blowing several times for a bridge as I have often heard them do in Chicago, would come under the head of unnecessary whistling?

Capt. Westcott—Well, I hardly know, but I would not think that this would be considered unnecessary whistling. (Capt. Westcott explained fully about Mrs. Rice's movements in New York in regard to unnecessary noises, her claim that it was killing

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people, in the hospitals and so on, and how she had taken her fight to Washington.) The D. & C. line and the Goodrich people have both issued orders that unnecessary whistling be done away with on their boats, such as passing salutes, etc. I know of one collision that can be laid to this.

Capt. Crowley—About blowing in a fog, I guess every man here has gone into Detour when the Detour whistle was blowing and there were a number of boats laying there to an anchor, and if he was only ringing his bell and not blowing his whistle, I think he would be very apt to get run into. There are times when you can hear a bell from one and a half to two miles, and then again you can't hear a whistle more than half a mile.

Capt. Westcott—In reply to that, captain, I can only say that I wouldn't for a moment undertake to tell you gentlemen what to do or what is best to do. I am merely trying to explain to you the rules and laws as they are, and if you had best have some other rule, then it is up to you to get busy and have the rules changed. The best thing you can do, of course, is to ring your bell at all times. The law permits a deviation from the rules to avoid immediate danger. If you blow your whistle all night that wouldn't be for immediate danger.

Capt. McGregor—I would like to move that the supervising inspectors be asked to make a ruling at their next meeting as to what constitutes harbor limits.

Capt. Westcott—If you want to get anything of that nature by the board, you will have to put it in the form of a letter.

Capt. McGregor—Well, I will put it in the form of a resolution for this meeting to vote on. (Seconded, unanimously carried.)

Capt. McGregor—There is another thing I would like to ask with reference to the rule where it says, "Any damage to life or property." Does this include any little minor damage?

Capt. Westcott—Any little minor damage, yes, sir. The customs house wants this for statistics.

F. B. Smith—Doesn't that require every licensed officer of the ship to make that report?

Capt. Westcott—Well, it says "Licensed officers," and we have always assumed that it would be better for the masters and engineers to make it in their own departments. We get lots of reports from engineers.

(Capt. Sullivan asked if the rule about reporting to the inspectors with reference to a vessel going into dry dock was not a new one, but Capt. Westcott said it was not less than 20 years old.)

F. B. Smith—I would say that w do that here from the office

Capt. Westcott—Capt. Sullivan, I am very sure that that has been a law for 20 years. About 3 years ago, a captain in Chicago had his license suspended for this offense. I think it was the steamer Lagonda of the Mitchell line. His license was suspended by Mansfield and Peck for refusing, and continuing to refuse to do it after they had requested him to do so over the telephone.

Capt. Morgan—In the meeting of the law, who are the licensed officers of a boat?

Capt. Westcott—I should say every man who holds a license, of course. I don't know what the courts would hold. We treat them as licensed officers as far as inspections are concerned.

Capt. W. H. Reed—Capt. Westcott, I would like to ask you in regard to the duties in standing-by. In case two vessels had collision and it turns out afterwards that one steamer is lost and the other one is looking after the damage to his own steamer to see what condition she is in and the man is then fined or his license suspended?

Capt. Stone—The law provides for this and says, "After looking after the safety of his own vessel," etc.

NICHOLSON SHIP LOG.

Barrett & Lawrence of Philadelphia, eastern agents for the Nicholson Ship Log Co., have received another contract from the Standard Oil Co., of New York, to furnish and install the No. 1 Nicholson ship log. This makes the third installation this concern has made on board ships of the Standard Oil Co. They are also busy preparing plans for a number of vessels in the United States navy, and about 15 yachts. The extreme accuracy and reliability of this instrument makes it of great value to any navigating officer. Just as the compass at any time shows the course, so does the Nicholson ship log at any time show the speed being made at the moment. It is also of great value as a check on fuel consumption.

Maj. J. C. Sanford, government engineer, has resumed dredging in the Delaware river to provide a 30-ft. channel to the sea. The channel is expected to be completed by June 30.

LAKE SHIP YARD METHODS OF STEEL SHIP CONSTRUCTION.

BY ROBERT CURR.

Fig. 11a shows an arrangement with a double strap.

Through the line F G the rivet holes are spaced and are in numbers equal to the line A B, Fig. 11.

The line H K next to the butt of

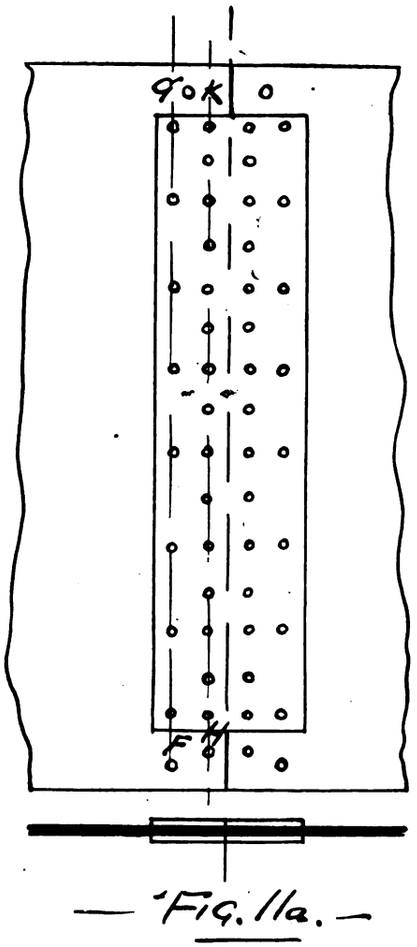

Fig. 11a.

the plate has a spacing of half the distance. See that double the number of rivet holes are punched.

Fig. 11a shows that a lapped butt is more effective with the same material than a double strapped butt.

In this example 46 rivets are used and the same amount of material but the strength of the riveted joint is defective by 133 tons compared with the weakest section of the lapped butt, Fig. 11.

There is one advantage in a double butt strap, the butt straps can be increased in thickness to overcome a close spacing of rivets in the middle rows and not become subject to fracture like EF, Fig. 11.

If the back rows of rivets are not too closely arranged the middle rows can always have a number of rivets

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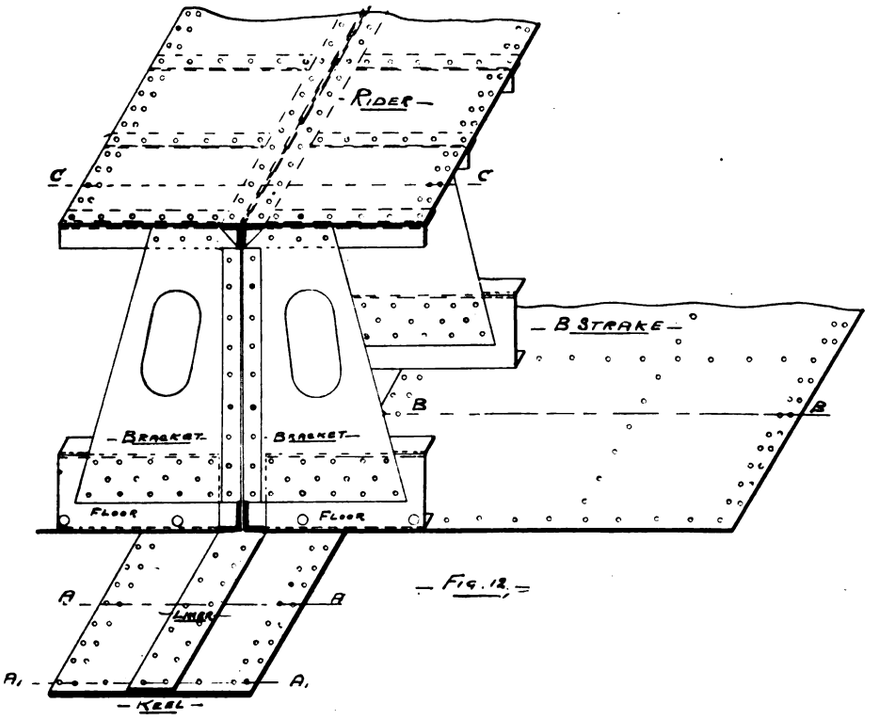
equal to the amount necessary to assist the back row in obtaining the desired result if a case of extravagance is not considered.

The center keelson has watertightness to contend with which makes the problem of butt connection more intricate.

Fig. 12 shows the keel, keel liner, B strake of shell plating and rider plate which contributes to the longitudinal strength of the ship.

The keel plate A A is the line of



— Fig. 12. —

frame and A A is the middle of the space.

At A A, there are 8 rivet holes punched 1 inch diameter and at A A only 6, which gives A A 2 inches more plate than at A A, across the frame.

The tensile strength of A A would be 26 tons per square inch and A A, 28, being across the unpunched part of the plate.

Considering this material which may be lightened up somewhere without injuring the vessel.

It may be used to advantage on the center keelson butt fastening.

Lapped butts are the most economical in every way that they are preferred as a butt connection on the center keelson.

The above example shows that there are 770.72 tons of spare over the unavoidable weakest section considering 4 passing strakes of plating, viz., one keel, one rider and 2 B strakes of shell plating.

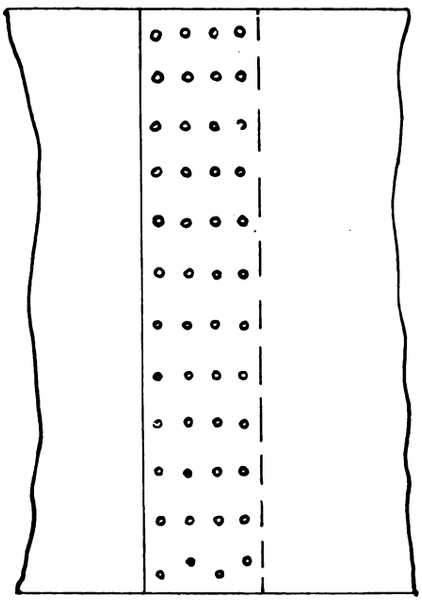
The point in view is the making of the butt lap watertight on the center keelson.

The watertight bulkhead in the tank can be made watertight with a pitch of six diameters of the rivet, the same can be done at the butt lap and the

Example: A A = 40″ — 6″ = 34″ × 15/16″ × 28 = 892.5 tons tensile strength.
" $A_1 A_1$ = 40″ — 8″ = 32″ × 15/16″ × 26 = 780.0 tons tensile strength.

" Strength over weakest part 112.5 tons tensile strength.
" C C across rider plate = 72″ — 6 × 13/16″ = 67.23″.
67.23″ × ½″ × 28 = 941.08 tons tensile strength
" $C_1 C_1$ = 72″ — 14″ × 13/16″ = 60.63″.
60.63″ × ½ × 26 = 788.06 tons tensile strength.
B B across B strake equals 84″ — 2 × 1″ + 2 × 15/16″ = 80.13″.
80.13″ × 11/16″ × 28 = 1,542.52 tons tensile strength.
$B_1 B_1$ = 84″ — 13 × 15/16″ = 71.8″.
71.8″ × 11/16″ × 26 = 1,289.92 tons tensile strength.
Keel plate A A is 112.50 tons stronger than $A_1 A_1$
Rider plate C C is 153.02 tons stronger than $C_1 C_1$
B strake plate B B is 505.20 tons stronger than $B_1 B_1$

Strength of 4 strakes 770.72 over weakest section.



— Fig. 12a. —

center keelson's weakest part can be fixed at same.

The center keelson plate is 60 in. x 9 16 in. thick, and by deducting 3 in. from the width of the plate for the first holes leaves 57 in. to be divided up for the number of rivets in the rows.

⅞ in. x 6 in = 5¼ in., the pitch

$\frac{57''}{5\frac{1}{4}''}$ = 10.8 or 11 spaces and 12 rivets in each row equal to 48 rivets.

12 rivet holes, 15/16 in. diameter equals 11.25 in. A B, Fig. 11, shows 15/16 × 9 = 8.44 in.

11.25 — 8.44 = 2.81. 2.81 in. × 9/16 in. × 26 = 41 tons.

The unavoidable weakest section A B, Fig. 11, has a tensile strength of 754 tons, then dividing this sum 754—41,

$\frac{754}{15}$ we get 48 rivets, so that the lap butt should have four rows of rivets, 48 in number, equal to a spacing of 5¼ in.

From the 770.72 tons space material only 41 tons are used in this example.

Leaving a surplus of 241.52 tons for the rider plate and keel without interfering with shell plating in any way.

The riveting is reduced by two rivets equal to 30 tons less than the example of Fig. 11, the butt connection is 30.38 tons less, as shown by example through line E F, Fig. 11.

Fig. 12a shows sketch of a butt lap with 48 rivets ⅞ in diameter.

The rivets agree with the material across the rivet holes and the butt

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connection is equal to the tensile strength of center keelson plate through line of rivet holes at watertight floor, Fig. 12b.

D, Fig. 12b, shows the center keelson with rivet holes A B for connecting the watertight floor plate C to same. Twelve holes 7/8 in. diameter are punched for the watertight collar.

As before stated the line A B, Fig. 12b, is weaker than through the line AB, Fig. 11.

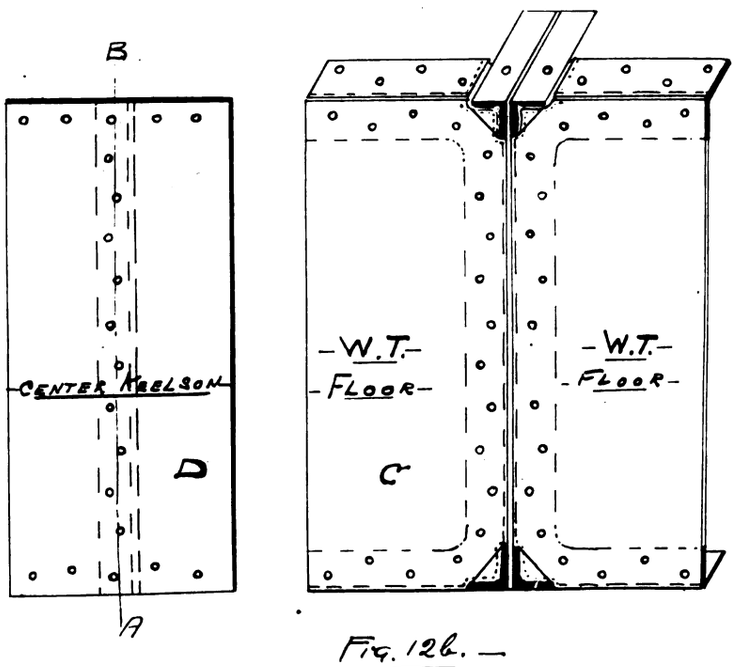

FIG. 12b.

Example: A B Fig. 11 = 60 — 9 × 15/16 = 51.56 = 754 tons.
" A B Fig. 12b = 60 — 12 × 15/16 = 48.75 = 713 tons.

Loss of strength at W. T. work 41 tons.

Considering the unavoidable weakest section at A B, Fig. 12b, effects a saving in cost over holding to the point A B, Fig. 11, which will be explained later.

Large angles are fitted on to the watertight floors so that an arrangement of zig-zag riveting be obtained and reduce as much as practicable a possible fracture through the line A B, center keelson D, Fig. 12b.

Closer riveting may be used through floor plate and the flange of the angle may be reduced in width seeing that there is no possible chance of reducing the area of section by the number of the rivet holes through same.

Mr. E. S. Henry, for many years superintendent of the docks at Ashtabula for Pickands, Mather & Co., died at Lakeside hospital, in Cleveland, last week.

2,000-TON RAILWAY DRY DOCK.

The H. I. Crandall & Son Co., engineers and contractors, have lately completed a 2,000-ton railway dry dock for the Richard T. Green Co., at their repair and ship building plant, Chelsea, Mass. The dimensions are as follows:

Length of cradle over all, 250 ft; width between docking platforms, 60 ft.; water over keel blocks forward, 13 ft; water over keel block aft, 17 ft; time of hauling a vessel of the heaviest capacity 20 to 30 minutes.

The site available to construct the dry dock was 445 ft. from the street to the harbor line. This short distance necessitated a grade of track of 1 to 12, and shows the great adaptability of this type under the most difficult conditions. So successful has this form of dry dock become financially that the Richard T. Green Co. has installed three during the past few years, all of which have been constructed by the above well-known firm of dock builders.

TWO REVENUE CUTTERS LAUNCHED.

Two new United States revenue cutters were launched at the yards of the Pusey & Jones Co., Wilmington, Del., one immediately after the other. The first was the Snokomish, designed for service in Puget Sound, and the other was the Davey, designed for service in the Gulf of Mexico. Each vessel is of the following dimensions: Length, 152 ft.; beam, 29 ft.; depth of hold, 12 ft.

UNIQUE ALBANY GREASE MAILING CARD.

A practical demonstration of the virtues of Albany Grease of special interest to the employer as well as the engineer is furnished in a mailing card received from Messrs. Adam Cook's Sons, 313 West street, New York City, the only makers of this ideal lubricant. The trouble and uncleanliness resulting from the use of substitute greases is shown in a sketch on the reverse side of the card of an engineer wrestling with the problem of the burning out of a bearing and drippings from hangers with the comment "Nothing worse I can imagine." This is in marked contrast to the pictured contentment of the smiling engineer seen when the card is unfolded, who, supplied with Albany Grease, points to the smooth running shaft above him and exclaims, "Nothing Easier I See," thus voicing the mystic letters OEZRIC which appear on the trademark of Messrs. Adam Cook's Sons.

There are also some interesting halftone engravings showing how Albany Grease has successfully replaced other lubricants that could not keep bearings cool even with the addition of ice and water in the plant of the Equitable Life Assurance Society, 120 Broadway, together with a letter from Geo. Gordon, chief engineer, testifying to the good results which have followed.

There are also views of an ingenious hand-made spindle Albany Grease cup as used on the 500-H. P. Corliss engine in the same plant.

Altogether the card is an unusual and interesting one and has a return postal attached for accepting the offer of Messrs. Adam Cook's Sons to send sample of Albany Grease, together with one of their grease cups for testing to engineers who will return the card with data necessary.

The Nassau, Germany's reply to the Dreadnaught, was launched at Wilhelmshaven last week and was christened by the Grandduchess of Baden. The Nassau is the largest battleship yet built in Germany, being 472 ft. long, 82 ft. 9 in. beam and 26 ft. draught. Her tonnage is 18,000 and horsepower 25,000. Her armament will consist of 12 11-in. guns, 12 6.6-in. guns and 8 3.4-in. guns, together with 6 torpedo tubes.

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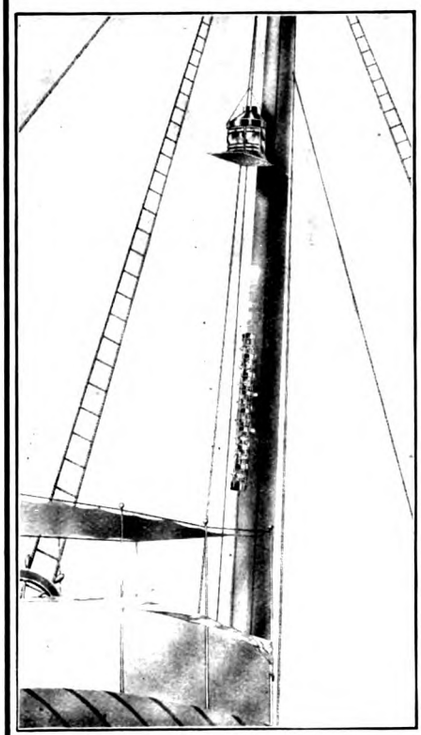

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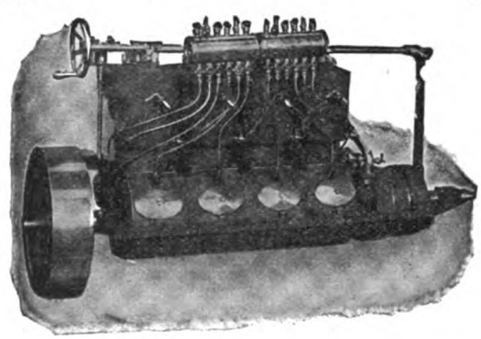

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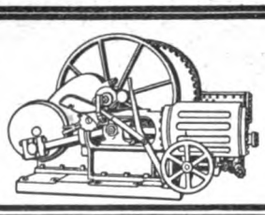
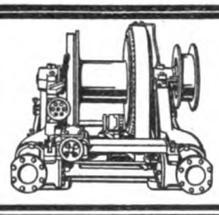
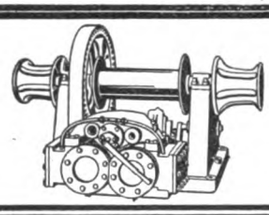

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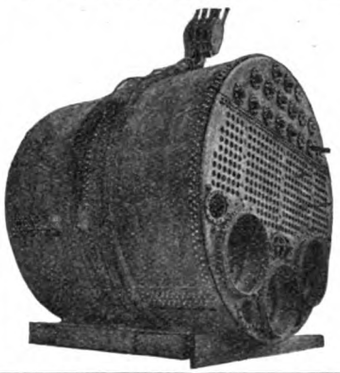

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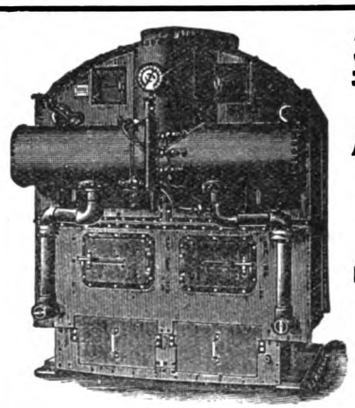

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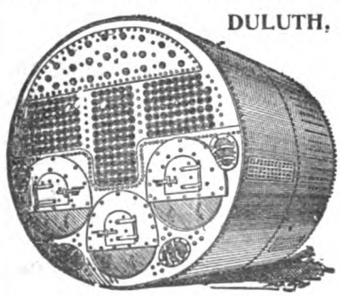

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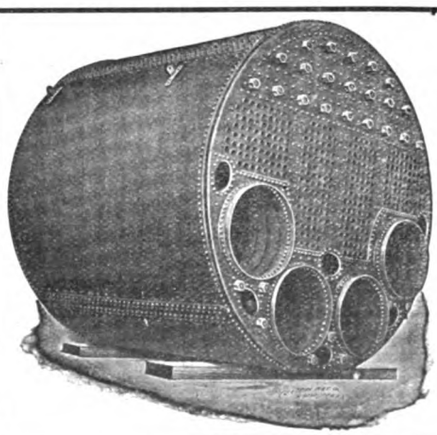

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PROPOSALS.

U. S. Engineer Office, 57 Park street, Grand Rapids, Mich., Feb. 24, 1908. Sealed proposals for extension and repair of south pier at Frankfort, Mich., will be received here until 3 P. M., March 25, 1908, and then publicly opened. Information furnished on application. M. B. Adams, Col. Engrs.

U. S. Engineer Office, Duluth, Minn., March 6, 1908. Sealed proposals for dredging and hire of dredging plant at Superior Entry, Wis., will be received here until noon Monday, April 6, 1908, and then publicly opened. Information on application. Graham D. Fitch, Major, Engrs.

U. S. Engineer Office, Jones building, Detroit, Mich., March 17, 1908. Sealed proposals for dredging Hay Lake and Neebish Channels, St. Mary's River, Mich., will be received at this office until 3 p. m. April 17, 1908. Information furnished on application. C. McD. Townsend, Lt. Col. Engrs.

U. S. Engineer Office, Duluth, Minn., March 10, 1908. Sealed proposals for furnishing steel plate at Superior, Wis., will be received here until noon, April 9, 1908, and then publicly opened. Information on application. Graham D. Fitch, Major Engrs.

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